New Housing Survey of the London Borough of Brent in 2008

An Interactive Qualifying Project

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Abstract

The London Borough of Brent has recently created over four thousand new homes throughout the Borough. Information pertaining to the levels of overcrowding in new homes and whether or not residents are satisfied with the new homes is crucial to the Brent Planning Service as it enables the planning officers to determine if their current planning strategies are working. Through the use of a mail survey of all newly developed homes in Brent, which achieved a response rate of 17.3%, we collected data pertaining to overcrowding levels and resident satisfaction. We found that overcrowding levels had increased drastically in new housing, and that most residents are generally satisfied with their homes on several criteria. We end our report by giving recommendations to the Brent Planning Service on how to better plan for new housing by including more amenity space to increase resident satisfaction and building larger homes to decrease the amount of overcrowding.

Acknowledgements

Our project could not have been completed without the help of many people from Worcester Polytechnic Institute and from the Brent Council. We would first like to thank the sponsor of this project, Michael Maguire, a member of the Policy division of the Brent Council Planning Service, who helped us to prepare our survey and then aided us in the analysis of our data. Michael was always very accommodating during all meetings and presentations and always showed support when helping us with our work.

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We also thank the Business Administration team, the GIS team and the Brent Council Post Room. The Business administration office helped us to gather the necessary supplies for mailing over 10,000 individual questionnaires and letters. The GIS team helped us learn GIS software in a very short amount of time. Most importantly, the Post Room graciously mailed out all our questionnaires and reminder letters.

We also thank our WPI advisors, Professors Stanley Selkow and Peter Hansen, who helped us with the writing of our report and the preparation of our presentation. Their feedback helped us to develop a successful report and helped us have a valuable experience in London.

Authorship Page

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Executive Summary

Urban planning is crucial for the success of any society. Without urban planning the construction of infrastructure can be rendered useless because of its inability to facilitate current or future demands. For example, bad planning would cause a newly constructed housing development being too small to accommodate current residents, or in the future, it being too small to accommodate residents.

To plan for its current and future demands, the London Borough of Brent's Planning Service has created a set of goals and policies it follows when planning for new housing developments. These goals, which are outlined in its Unitary Development Plan (UDP), include providing enough affordable housing to reduce homelessness, ensuring housing units have enough room to accommodate residents, and providing amenity space such as a garden to improve residents' satisfaction with their home. These goals and policies were developed not only to address the Borough's current housing needs, but also its expected future needs.

Brent's planning department has been following the policies in the UDP for several years, but little is known about their effectiveness. This project investigated the adequacy of the UDP's housing policies by surveying homes built within the past five years. Our goals were to research household size, overcrowding, and residents' satisfaction with their homes in new housing. This will allow planners to create better housing developments in the future.

Methodology

A postal questionnaire was distributed to each of the recently created homes which asked questions regarding the number of people living in the home, residents' satisfaction, amenity

space, total number of rooms, and other information important to planning officials in the Borough. We used reminder letters and cash prizes to help to increase our response rate; we achieved a final response rate of 17.3%.

The results of each returned survey were entered into a database, and the data were analyzed. Graphs, tables, and charts were produced to organize our data and present it in an easily readable form. Also, statistical inference was carried out to provide a degree of confidence in our findings. Our analyses focused on matters of particular interest to Brent planning officers such as the average household size of new housing, the degree to which new homes are overcrowded, and how satisfied residents are with new housing.

Findings

Our main findings and results showed several useful trends. These findings and trends are:

- The average household size in recently created housing units is 2.48 persons per house
- Rented units, both social and private, have larger household sizes than the average recently completed unit, 2.76 persons per unit and 2.56 persons per unit respectively
- Homes which are occupied by people who have migrated to the United Kingdom in the past five years have larger household sizes, 3.04 persons per house, than those who have lived in the United Kingdom for five years or longer, 2.55 persons per house
- 27% of new housing units are overcrowded, compared to an overcrowding level

of only 5% for all homes in the Borough in 2001. This finding caused us to pursue further analyses, which show:

  - On average, residents that were living in overcrowded accommodations were satisfied with the number of rooms in their house
  - Households with two or more children yield an average person per room above the overcrowding level

- Providing extra amenity space, such as a garden, or a balcony, patio, or roof terrace, improves a residents' satisfaction with their home

Based on these findings, we have formulated the following recommendations:

Study of Recent Migrants

We recommend a future study in the area of recent migrants. Our research indicates that the household size of residents who moved to Brent from somewhere outside of the United Kingdom in the past five years have a larger household size, 3.04 persons per house, than those who have lived in the United Kingdom for five years or more, 2.55 persons per house. This study should investigate the reasons that migrants have larger household sizes, the types of developments that recent migrants are likely to move into, and a method for predicting migration patterns in Brent. The results of this study could be used to help planners forecast migration patterns, and plan for new migrants accordingly.

Study of Overcrowding

Our findings show that residents living in an overcrowded home are generally satisfied or neutral about the number of rooms in their homes. Because overcrowding does not seem to be

lowering residents' satisfaction, other possible negative effects of overcrowding under the current definition should be investigated. It is currently known that overcrowding has the potential to cause the spread of disease and increases the likelihood of children not completing their education. We feel that the Brent Council should undertake a study of recently completed developments to investigate these effects, as well as other possible effects; this will help to determine the seriousness of the increase of overcrowding in recently completed developments.

Also, there are currently two definitions of overcrowding being used by the Brent Council. The first definition of overcrowding is if there are more people living in a home than livable rooms. The second is a home is overcrowded if there are more people living there than bedrooms. The use of these two definitions makes data comparison difficult. We recommend that the definitions be standardized. Also, both definitions have shortcomings; the first one suggests that someone living in a kitchen is not overcrowded, while the second suggests that a husband and wife sharing a bedroom may be overcrowded. We recommend formulating a new standardized definition which is resilient to these shortcomings, as well as other potential shortcomings.

Increase the Size of Newly Developed Homes

We recommend that planners in Brent provide larger homes. Our data show that 27% of newly developed homes are overcrowded. This is a large increase from borough-wide overcrowding in 2001, which was only 4% (Association for London Government, 2004). In order to decrease overcrowding in future housing, we suggest more bedrooms be added to new home plans.

We support the Local Development Framework's recommendation of changing the

definition of family sized housing from a house with two or more bedrooms to a house with three or more bedrooms. We found that on average, a household with two or more children is overcrowded, suggesting that most families live in overcrowded houses. We believe that by providing larger homes to families, the impact of children on overcrowding will not be so significant.

Provide More Amenity Space in New Developments

To increase residents' satisfaction we recommend that planners require developers to provide some sort of outdoor amenity space for residents. We found that resident satisfaction was greatly increased in households that had some sort of outdoor amenity space, such as a garden (communal or private), a large balcony, a patio, or a roof terrace. Providing something as simple as a communal garden is fairly cheap and easy to do, and appears to greatly increase residents' satisfaction with their homes. In areas with limited ground space, amenities such as balconies or roof terraces could be used.

We believe that these recommendations will help planners to provide better housing in the future. Specific issues addressed include migration, overcrowding, and resident satisfaction. By following these recommendations, we feel that planners will be able to accommodate Brent's current and future population, and ensure that its residents are satisfied with their homes.

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I Introduction

Urban planning is an essential responsibility of local government. Planning enables a government to provide its citizens with necessary infrastructure, such as schools, public sewer systems, and adequate housing (Anderson, 2000). Good planning enables a city to build infrastructure that has the capacity to accommodate the current population and also the projected population of the city for years to come. Without proper planning for future needs, existing infrastructure might become out of date shortly after it is finished.

For a local government to be successful it must plan well. However, planning requires detailed knowledge of several variables covering a broad range of factors. Knowledge of important factors such as total population size and average household size are necessary for developing city-wide planning strategies, such as deciding the amount of new housing required. Factors such as the amount of parking available, amenities available to residents, the population demographics of the area, the physical restraints of properties, and the desires and satisfactions of the residents all need to be taken into account in each individual new development's plan.

The Brent Council planning department, known as the Planning Service, currently faces a major problem. Because of a supposed under enumeration in the 2001 Census, there is no way to accurately estimate the Borough's population (Maguire, 2008). Instead, the Borough has had to rely on several population studies, which propose widely varying estimates (Maguire, 2008). Thus, the Planning Service is currently planning for an unknown amount of people. Also, because the 2001 Census data is questionable, there is no accurate way to project how much the population will grow in the future, making it increasingly difficult to plan effectively.

Without an accurate knowledge of the incoming population, developing an urban spatial planning strategy has proven to be extremely difficult. Specifically, it is difficult to determine how many homes should be built and how many rooms each home should have. The Planning Service has a set of policies it is currently following in its Unitary Development Plan (UDP) which attempt to address these concerns. They are now attempting to discover if their recent urban spatial planning policies were successful. Over the past five years more than 4,500 homes were built across the Borough, but little information has been collected on the new residents of these homes. This presents a problem for the Planning Service as they continue to plan for the future goal of building over ten thousand new homes between the years of 1997 and 2016 (UDP, 2004). By collecting data pertaining to the recently built homes, the Brent Council can determine whether or not their strategy worked and can then change their plans for the future accordingly.

In order to determine whether or not their urban planning strategies worked, the Brent Council Planning Service asked us to conduct a housing survey in which we were to collect data on each newly developed household's number of people, number of rooms, and amenity space. Data was also collected pertaining to a resident's satisfaction with their current residence, income, whether or not they were sharing their home and their method of travel to work. To collect this information, we conducted a mail survey and a small number of door to door interviews.

The data collected was analyzed in order to look for trends. By using statistical inference, we were able to confirm or deny the robustness our findings. Data was also plotted on maps using GIS software so that trends could be more easily spotted and presented.

II Background

In this chapter, we begin with a basic introduction to the Borough of Brent, which sets the stage for our challenge of determining the adequacy of recently constructed housing developments. Next, a discussion of planning and its vitality to the Borough highlights the importance of our project. We will also introduce new immigration patterns and an increase in private housing rentals, recent trends that have made population monitoring and planning especially difficult. Then we will identify and explain the measures and methods currently used by the Borough for planning purposes. We then discuss the issue of overcrowding and its importance to the Borough. Finally, we present methods employed by large organizations, such as the United Nations and the American Housing Association, to carry out a housing survey.

II.1 London and the Borough of Brent

London is the capital of the United Kingdom and is one of the most influential cities in the world. It is the main force behind the United Kingdom's economic and political success and has a population of over seven million residents (London Councils, 2008). Geographically, it consists of thirty two boroughs, each with its own governing councils (National Statistics, 2002). The London Borough of Brent is located in northwest London and, according to the 2001 Census, has a population of 263,464 people (The Greater London Authority, 2008). Brent was formed as a Borough of London in 1965 with the combination of the former boroughs of Wembley and Willesden (London Councils, 2008). Brent's exact location within London can be seen in Figure 1 below,

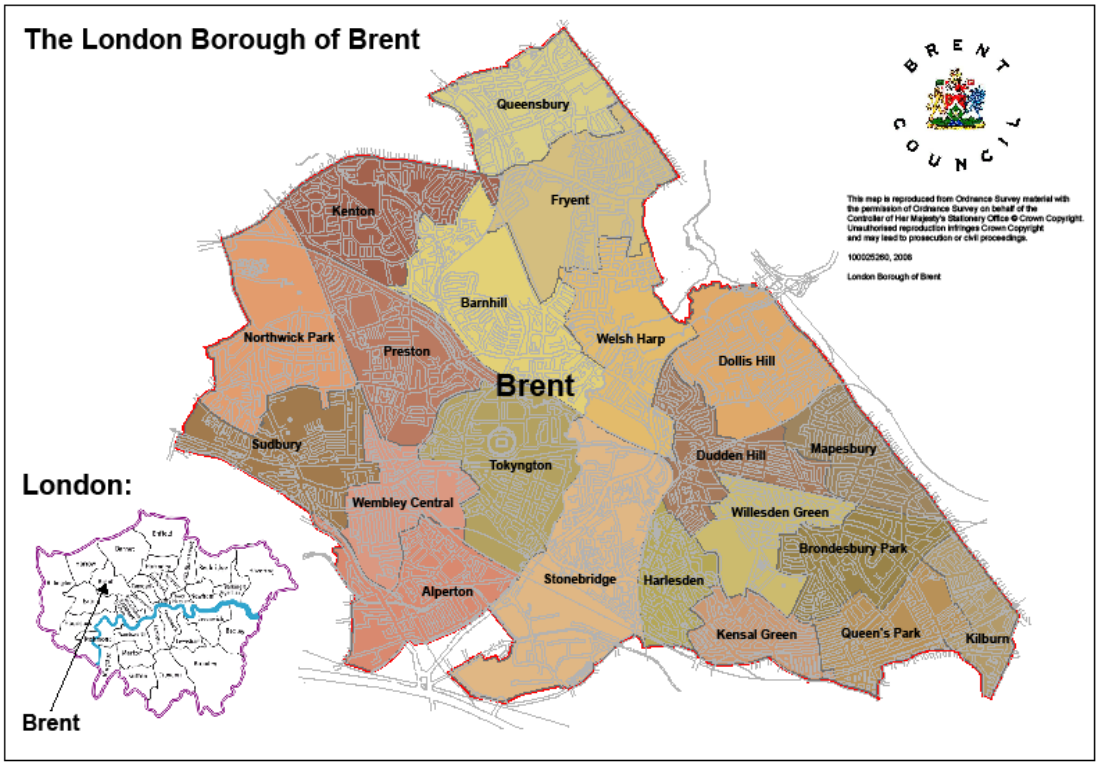

Figure 1:London and the Borough of Brent (Brent Council, 2001)

Brent is the most ethnically diverse borough in London, and is known as one of the poorest boroughs in London (London Councils, 2008). One striking fact about the Borough is that nearly fifty percent of the population was born outside the United Kingdom (London Councils, 2008). Figure 2 shows a breakdown of the ethnic groups who reside in the Borough of Brent (Brent Council, 2001). The figure shows the diversity of Brent, with the main focus being that more than half of the population is non-white, unlike the rest of London, which is predominantly white (London Councils, 2001).

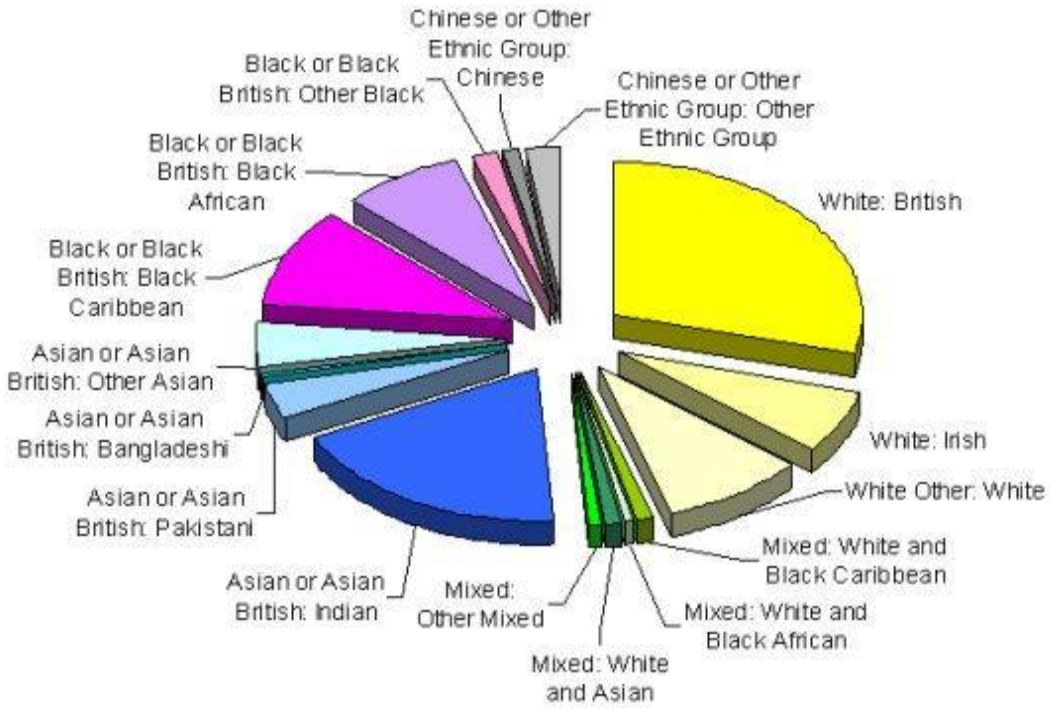

Figure 2: Ethnic Breakdown of the Population of Brent (Brent Council, 2001)

II.2 Urban Planning

A local government's ability to plan well is important for the success of the society it governs. In the Brent Council's view, "planning has a positive effect on the local environment. It co-ordinates the development of homes and places of work and helps to ensure that they are accessible and built in the right places in the right way" (Brent Council, 2007). Urban planning helps a government maintain its current infrastructure. Urban planning also enables a region to properly prepare its future plans for infrastructure, such as schools and sewer systems. A result of good planning could be a city being able to accommodate the needs of its residents; for example, a city or town could build a building, such as a school or hospital, which will have enough space for the current population but also be able to accommodate changes in the future.

Bad planning results in stressed or failing infrastructure and not having enough infrastructure or enough space for the future (Anderson, 2000). Part of maintaining this infrastructure involves ensuring there is adequate housing.

A major factor which contributes to whether planning is successful or not is having an accurate measure of the population. If a region's population is unknown, then urban planning will not be effective, and the citizens of that region will suffer. Another factor which affects planning is the rate of change of population size, otherwise known as the growth rate. An increase in population can eventually lead to an increase in births, increasing the population even further. This concept is very similar to the concept of exponential growth, which shows how a population starts out growing slowly, but grows faster and faster as time goes on. Using a basic exponential growth formula ($A = P \cdot e^{r \cdot t}$), we can show that a population growing steadily at a rate of 2% per year will be 150% of its current size in a little more than 20 years, and will be double its size in 35 years. Without accurately knowing the current population size, it becomes difficult to calculate the population's growth rate, which can lead to unexpected growth. Significant problems can arise from a growing population if the growth is not expected; these problems include: a lack of schools to educate a large number of children, unemployment or underemployment, increased food demand, increased stress on existing infrastructure such as sewage, water, and electrical systems, and over-exploitation of natural resources (Bogue, 1969).

Although knowing the population allows planners to develop an adequate supply of housing to allow everyone in a region to have a place to live, there are other factors to consider. When planners develop future planning strategies, they must also ensure that residents are happy with the current living conditions. For example, if planners found out that residents were

dissatisfied with current parking accommodations, the planners would need to consider planning for additional parking space in future developments. By knowing residents' feelings on their current living conditions, such as parking accommodations, degree of over crowdedness, or quality of communal space, and by knowing the area's population, planners are able to develop a planning strategy which will accommodate and satisfy a future population.

II.2.1 Planning in Brent

Planning in Brent stems off of the "London Plan," a spatial development strategy developed in 2004 to make London "a vibrant, successful, efficient and socially inclusive city. Clean and green. An example to the world" (London Councils, 2004). The London Plan is meant to make London a city that maintains its status as one of the most important cultural and political regions of the world but becomes sustainable and environmentally friendly, all while giving its citizens an above average quality of life.

The Borough of Brent has also established its own specific plan known as a Unified Development Plan (UDP). Anything which is planned for in this document must first conform to the standards put forth in the London Plan (London Councils, 2004). The UDP focuses strictly on the Borough itself and has much more dedication to accommodating its own unique population. One of the main goals of the UDP is to control the development of non-residential site near residential areas. It states that no building permits will be granted if a proposed building will "… interfere with neighbors, the environment or traffic conditions" (Brent Council, 2007). This policy helps to ensure that the quality of residential life remains high, even as non-residential projects are built.

The UDP also has policies regarding the characteristics of the units built in new developments. It sets out to provide enough government subsidized housing so that all residents have a place to live, and to make sure that they are large enough to prevent overcrowding. It also states that developments should be built with some sort of amenity space, such as a garden or patio, which provides residents with outdoor leisure space (UDP, 2004.)

II.3 The Changing Population of Brent

In 2001, the national census for the United Kingdom stated that approximately 263,000 people lived in the Borough (National Statistics, 2001). It is believed that this figure under enumerated many of the Borough's residents. Recently conducted studies and estimates show that since 2001 the population of the Borough has increased, but have yielded results that vary by nearly 20,000 people (Maguire, 2008):

> *According to the Government (largely 'projecting' from the 2001 Census, which undoubtedly under-enumerated), Brent had 271,400 residents in 2006. The Greater London Authority, using effectively the same databases but with more sophisticated demographic modeling, subsequently increased this estimate to 279,200 for 2007. However, a recent study undertaken for the Council by a leading demographic academic, using radically different methodology estimated that Brent could have as many as 289,100 residents (Maguire, 2008, p. 1-2).*

The Borough does not know which one of the three population estimates is correct; this raises a serious problem. Brent's ability to develop effective plans has been seriously diminished

because of an incomplete knowledge of its population. Also, since the Borough does not know the actual population, there is a concern that the Borough is not receiving the proper amount of central government funding (Mayhew, 2007).

Brent believes an estimate of 289,100 residents, which was published by Leslie Mayhew, a leading population researcher, is the most accurate because it did not rely on the 2001 census to obtain its results. Instead of relying on census data, Mayhew matched residents' addresses listed in different governmental databases, such as voter registration or healthcare registration, to the addresses listed as being residential by the Borough. This contrasts the methodology of the government's estimate of 271,400 residents, and the Greater London Authority's estimate of 279,200 residents because they both based their population figures on data provided by the 2001 census. Because the census is believed to have under enumerated residents, population estimates based on its findings are also likely to under enumerate the population of the Borough. It is therefore a valid assumption that Mayhew's population estimate is the most accurate.

The inaccuracies in recent population estimates have been caused both by the under-enumeration in the 2001 Census and recent trends that the Census could not account for. These include changes in immigration patterns and changes in ownership type. First, the Planning Service believes that "… the official population methodology has undoubtedly underestimated the current population of Brent as it is has systematically failed, in particular, to identify many recent migrants, particularly from Central and Eastern Europe" (Maguire, 2008). Second, the recent increase in privately rented homes may have also increased average household size in many developments, which in turn has inflated the population (Chou, Rockwell, Vanis and Vargas, 2005). Each of these issues will be discussed in the following sections.

II.3.1 Migration Patterns in London and Brent

In London, migration is one significant cause for a change in population size and composition. There are two major forms of migration: a) internal migration, where people migrate within a nation and b) international migration, where people migrate across nations (Bogue, 1969). In general, more Londoners move within London than move out of London (Greater London Authority, 2001). Of those people who move into the city, there is an about even split between people who come from other areas of England and Wales and those who lived outside of Great Britain (Greater London Authority, 2001). The Brent Council is concerned that international immigrants may be affecting the current population estimates, in that they may not have been properly accounted for accurately in the past. Specifically, there has been a large increase the amount of Eastern Europeans migrating to Brent; this may be due to international migration agreements made by members of the European Union, which has allowed immigrants from European countries to migrate elsewhere in Europe easily (Brent Council, 2006-07). The effects of this migration phenomenon may be complemented by the recent increase in privately rented housing.

II.3.2 Changes in Ownership

There are several types of ownership practiced in Brent. In private rentals, the residence is owned by an individual who rents housing space to tenants. Often times, these tenants receive housing benefit from the government, meaning that a check is sent to them which is to be used to help the tenant to pay their rent. Another ownership type is affordable housing; in this type of housing, the government gives an amount of money to developers that is proportional to the

amount of affordable units which are going to be in the development. This allows the rent for these units to be significantly less than if the developers' construction costs were not subsidized. Many people living in this type of housing also receive housing benefit. Houses can also be sub-rented; this is when the owner shares living space with a renter. In cases of simple ownership, residences are owner-occupied with no renters. Finally, in shared-ownership, a resident can buy a percentage of an affordable housing dwelling with the option of buying a greater share over time.

It is believed that the amount of housing rented out by private landlords has recently increased throughout London. The investment strategy of "buy to let" is believed to have caused this increase. "Buy to let" is an investment strategy where investors purchase properties and then rent them out to a group of unrelated people, such as a group of students. Over the last five years, the number of homes being purchased and then rented out for "buy to let" purposes has grown drastically; "Buy-to-let lending in the UK now accounts for 12% of all mortgage advances, compared with just 3% five years ago" (BBC, 2007). In Brent, "buy to let" has been identified as one of the main causes for why more children were living in the Borough than previously known (Chou, Rockwell, Vanis and Vargas, 2005). The effects of "buy to let" on the number of children living in Brent houses were first discovered in a Worcester Polytechnic Institute (WPI) study conducted in 2005.

It is likely that recent trends in private rental households partially caused the inaccuracies of the recent population estimates. Residents who rent property from a private landlord are often composed of a group of people sharing a household with no relation, i.e. not family members or not dating. Planning officers have communicated to us that people in this living arrangement often attempt to "dodge" the census in order to avoid paying taxes. Because the number of non-

respondents was increased, the results of the 2001 census were skewed further. Our project studied the effects of privately rented housing on average household size.

II.4 New Developments in Brent

Our study focused on recently completed housing developments in Brent, i.e. housing developments completed within the past five years. These developments exhibit a unique set of characteristics which must be discussed. The reason for new developments being so unique is that planners have to follow new policies outlined in the UDP. The most noticeable characteristics are the amount of social, or affordable, housing provided in recent developments and the size of these developments.

II.4.1 Affordable Housing

Affordable housing is government subsidized housing, and is provided to residents who can not afford to pay one third of their gross household income to a mortgage whose monthly payment is equal to 35% of their net household income (UDP, 2004). In recent developments 75% of the units are affordable (AMR, 2006-07). The proportion of affordable housing to non-affordable can be seen in Figure 3.

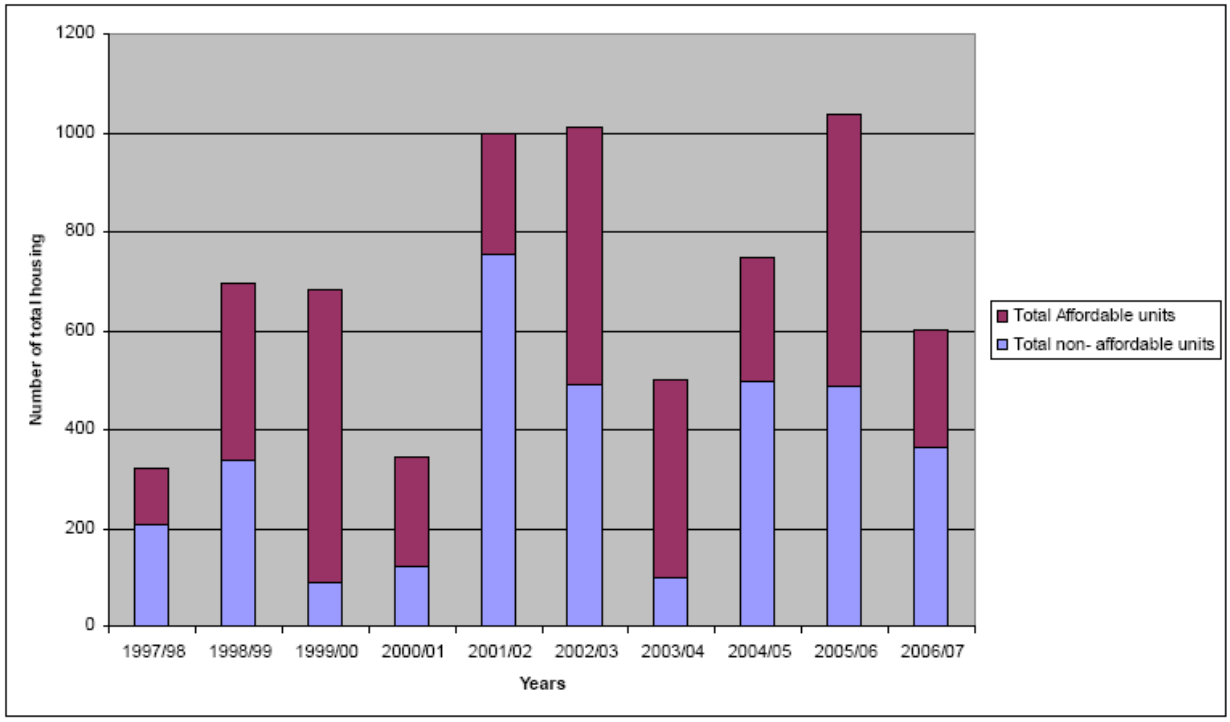

Figure 3: Proportion of Affordable Units to Non-Affordable Units (AMR,2006-07)

This increase affordable housing production has led to a decrease in the amount of newly built private housing, even though it has increased throughout London as a whole. Private housing consists of housing where the unit is privately owned, rented through a private landlord, or sub-rented.

II.4.2 Size of New Units

Many of the housing units built in the past five years are smaller than ones built previously. These recently completed units typically only have one or two bedrooms. Although the UDP states that a two bedroom unit is large enough to house a family, planning officials consider units of this size to be inadequate for family housing (AMR, 2006-07). An exception to the development of small one or two bedroom units is in developments with less than fifteen

units. These units are typically larger, having three or four bedrooms. Brent planning officials believe developments of this size are larger because of the UDP requirement that developments of 15 units or more provide affordable housing. By decreasing the amount of units in the development, developers are able to provide larger housing units, while avoiding needing to provide affordable housing (AMR, 2006-07).

II.5 Estimating Total Residents in New Housing Developments

The total population of Brent's new housing developments can be most easily estimated by determining its average household size. Currently, the Borough of Brent is home to the second highest average household size in London, roughly 2.7 persons per household (Meyhew, 2007). By determining the average household size, and multiplying the household size by the total number of new houses, one can easily estimate the size of the population across new developments. This is done by multiplying the average household size by the total number of houses.

The UDP states that it is Brent's objective to construct 9600 new homes between 1997 and 2016 (UDP, 2004.) Our survey was sent to approximately 4700 households built since 2003, which represents about one half of the planning department's goal. By using the methods outlined above with the average household size we have measured, planners will be able to determine the population yield from the remaining units they construct between now and 2016. This information will be useful in determining the amount of infrastructure required. It is important to note that this technique is based on the assumption that the population will continue

to grow in a predictable fashion.

II.5.1 Determining Population through Surveys and Censuses

Data related to an area's population can be collected through surveys, which sample a portion of the population, or through censuses, which include the entire population. Many countries, including the U.K., complete a census once every 10 years to determine the population with a high degree of precision and gather important data for government politics, urban planning, and social growth (Bogue, 1969). Because of the time and money required to conduct a proper census, many countries perform surveys in between census periods. Although surveys come with a certain amount of error because the sample size leaves out portions of the population, this study used one because of time and cost constraints.

II.5.1.1 Wandsworth Survey

In 2004, the Borough of Wandsworth conducted a highly successful housing survey similar to ours. Wandsworth gathered data pertaining to number of people per household, dwelling type, tenure (whether a resident rents or owns his home), age of residents, and previous residence. One of the main applications of these data was to assist in reviewing planning policies for household development in the Borough. Using a strategy that involved a cover letter, three rounds of reminder letters sent to non-respondents, and financial incentives, an overall response rate of 49 percent was achieved (Wandsworth Survey, 2004). Our methods derived from this strategy in order to achieve similar returns.

II.6 Conducting a Housing Survey

To conduct a scientific housing survey, the household definition must be standardized, the survey must contain several essential features, the survey must measure the proper variables, and an adequate sample must be selected. A survey that meets these criteria can be used to make strong claims about the accuracy of its findings.

II.6.1 Definition of Household

The United Nations Department of Economic and Social Affairs Division for Sustainable Development says that two types of residences must be investigated to determine an area's household size, one of which is counted in a housing survey, and another which is not. The first type, housing unit, refers to a place of residence, such as an apartment or a house, and is counted in a survey (United Nations Division for Sustainable Development, 2003). The second type, collective living quarters, is a unit which consists of a person or group of people who work together to provide food and other items required for living. Many of these units do not hold permanent residents of the region, and are therefore not counted in a housing survey. Uncounted units include, but are not limited to, hotels, hospitals and military bases. A diagram showing the types of living quarters in each definition can be seen in Figure 4. This figure provides examples of the types of housing which will be investigated in this study.

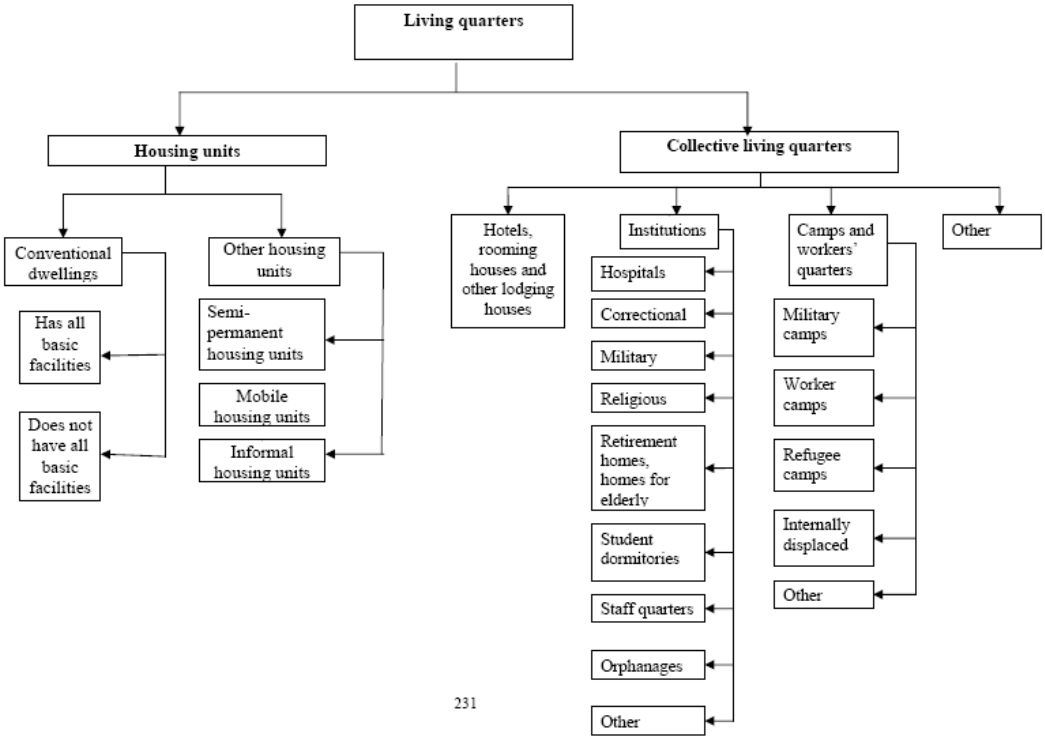

Figure 4: Household Classification (United Nations, 1980)

For the purpose of this project, household was defined as "a single person, a couple living together (whether married or not,) or a family, including children or other relatives." To address concerns regarding groups of unrelated people sharing a residence, information about all people in the housing unit was also recorded.

II.6.1.1 Overcrowding

Overcrowding occurs when a household sleeps more people than "rooms which are determined to be suitable for sleeping arrangements" (London Councils, 1985). Any room in a household, including a living room, large kitchen or dining room, can count towards one of the suitable rooms. Thus, a household with two bedrooms, a living room and a kitchen which is large enough to hold a table and chairs would count as having four suitable rooms. In general,

however, it is easier for statistical purposes to define overcrowding as having more than one person per suitable room. Severe overcrowding occurs when there are more than 1.5 people per suitable room.

Another definition of overcrowding was used by Fordham Research in 2004 when they were conducting a housing study for the Brent Planning Service. This definition stated that overcrowding occurred in any household that had fewer bedrooms than it did occupants (Fordham Research, 2004).

The overcrowding of homes has become a major problem in London where five percent of homes are considered overcrowded (Association of London Government, 2004). The 2001 census indicated that the overcrowding level in Brent was 4% indicating that Brent is less overcrowded than London on average (National Statistics, 2001). Overcrowded homes have negative implications for both children and adults. Children living in overcrowded homes are less likely to finish secondary school (The Urban Prospect, 2001). They are also at an elevated risk for meningitis and tend to have poor health as adults (Office of the Deputy Prime Minister, 2004). Adults living in overcrowded conditions are known to have higher mortality rates, especially among women (ALG, 2004). Additionally, the resurgence of tuberculosis in London has been concentrated in the most overcrowded housing (Bhatti et al, 1995).

The London Councils have recently developed a plan to combat overcrowding in the city (London Councils, 2006). The plan calls for Boroughs to build larger homes, encourage families to purchase family sized homes, and provides funding for helping those in overcrowded situations. Our survey collected data on number of rooms and number of residents in recently constructed homes, which allowed us to determine if they are large enough to house the families

that are moving into them.

II.6.2 Essential Survey Features

There are two features of a housing survey which are essential to the success of our project: a) individual enumeration and b) universality within a defined territory.

The first essential feature, individual enumeration, means everyone interviewed in the survey must be listed, and all of the qualities measured by the survey must be recorded for each individual. This allows data collected from different regions to be cross-referenced with other data (United Nations, 1980). If the qualities measured by the survey are not recorded for each respondent, then non-response to each individual question must be accounted for by assuring incomplete data is not used during analysis. For example, if a respondent does not answer a question about his or her income, then information from that respondent cannot be used in any analyses related to income. However, analyses which rely on other data that the same respondent did provide can include the data from the respondent.

The second essential feature is universality within a defined territory. The region in which the survey is being conducted must be well defined, and its characteristics noted. This allows the data collected in a region to be applied to other regions with similar characteristics. Although all housing units should be counted within the defined territory, sampling techniques can be used, provided they include a large enough representative portion of the population (United Nations, 1980).

II.6.3 Survey Variables

In a housing survey, several variables are measured, to describe the population. The units to be enumerated and analyzed are persons, households, institutional populations, living quarters or housing units, and buildings. The variables to be enumerated are shown in the Table 1 (United Nations, 1980). Buildings are defined as any free standing structure with at least one room and exterior walls (United Nations, 1980). Because this is a lengthy list, it is important to be able to narrow down the variables to only the ones necessary for the survey. To do this, one must first consider the needs of the agency for which the survey is being conducted (United Nations, 1980). Second, the respondents must be considered when deciding which variables to investigate. The questions asked must not cause the respondents to be fearful or angry. Finally, the resources available must be considered (United Nations, 1980). For our project, the needs of planning officers were the governing factor in determining the variables to be enumerated.

Table 1: Survey Variables to be Enumerated (United Nations, 1980)

No.	*Topic*	*Living quarters*		*Building*	*Households*
		Housing units	*Collective living quarters*		
1	Living quarters – type of	▫	■		
2	Location	▫	■	▫	▫
3	Occupancy status	■			
4	Ownership – type of	■			▫
5	Rooms – number of	■			▫
6	Bedrooms – number of	◇			◇
7	Useful floor space	◇	◇		◇
8	Water supply system	■	◇		▫
9	Drinking water - main source of	■	◇		▫
10	Toilet – type of	■	◇		▫
11	Sewage disposal	■			▫
12	Bathing facilities	■	◇		▫
13	Kitchen – availability of	■	◇		▫
14	Fuel used for cooking	■			▫
15	Lighting and/or electricity – type of	■	◇		▫
16	Solid waste disposal – main type of	■			▫
17	Heating - type and energy used for	◇			◇
18	Hot water - availability of	◇			◇
19	Piped gas - availability of	◇			◇
20	Use of housing unit	◇			◇
21	Occupancy by one or more households	▫			■
22	Occupants – number of	■	■		▫
23	Building – type of			▫	
24	Construction material of outer walls	▫		▫	
25	Year or period of construction	◇		◇	
26	Dwellings in the building - number of	◇		◇	
27	Construction material of floors, roof	◇		◇	
28	Elevator - availability of	◇		◇	
29	Farm building	◇		◇	
30	State of repair	◇		◇	
31	Age and sex of head or other reference member of household				■
32	Tenure				■
33	Rental and owner-occupied housing costs				◇
34	Furnished/unfurnished	◇			◇
35	Information and communication technology (ICT) devices - availability of				■
36	Cars – number of				◇
37	Durable household appliances - availability of				◇
38	Available outdoor space				◇
	Legend:				
	■ - Core topic				
	▫ - Core topic, derived				
	◇ - Additional topic				

II.6.4 Selecting the Sample

The American Housing Society, (AHS) provides methods for selecting the survey sample. First, they divide the nation into counties, a group of counties, or independent cities, which are

known as primary sampling units (PSUs). If the independent city has a population of 100,000 or more, it is considered self-representing, and is automatically included in the survey. The remaining PSUs, the ones which were not self-representing, are then grouped, and the one with the most housing units in each group is selected to represent that group. Within each PSU, every housing unit is categorized in one of four ways: housing units selected from the 1980 census, new construction in areas that require building permits, housing units missed in the 1980 census, and other housing units added since the 1980 census. The questions asked in the survey are based on what category the housing unit falls into (U.S. Census Bureau, 2006).

Our project lends itself to a similar approach. Brent planning officers have already indicated that primary reasons for the population discrepancies are an under-enumeration of residents living in privately rented homes and recent changes in immigration patterns. In this project housing developments were grouped by year built; planning officials felt that the most obvious PSU to choose would be recently developed locations. This is because they felt that since no one living in these developments has been doing so for very long, they are more likely to exhibit these trends than people living in older housing developments.

Although this appears to be a valid approach, its limitations must be discussed. Because of the bias in the sample selection, attempting to obtain as many responses which show recent population trends as possible, the results will not necessarily be representative of the entire population of Brent. It is therefore important to only use the results of this study to determine the effects of private rentals and immigration on population and household size of new homes, and to not judge the population and household size of all of Brent solely on the findings of this report.

II.7 Summary

It is clear that Brent is a borough with a highly diverse and constantly changing population. The issues of immigration and privately rented homes have further complicated efforts to track and predict population growth and will be vital areas of focus. We have also stressed the importance of accurate demographic data to the planning function carried out by the Borough. The validity of this data directly affects Brent's ability to provide a high standard of life for its residents in addition to sufficient infrastructure and services. Relevant factors on which we gathered data included household size, ownership type, number of rooms, housing type, location, previous residence, parking availability, quality of communal space, and ages of residents. We used this raw data to create data on overcrowding and resident satisfaction. Our efforts focused on analyzing these data to help the planning department provide the residents of Brent with the highest quality of life possible.

III Methodology

The goal of this project was to analyze housing occupancy, overcrowding, and resident satisfaction in new developments in Brent in order to evaluate the effectiveness of recent planning policies. To accomplish this, we conducted a mail survey and door-to-door interviews.

After compiling our results, we analyzed the data looking for trends. The conclusions drawn from these trends were confirmed or rejected using statistical inference. GIS software was utilized so that localized and borough-wide trends could be identified. Our research was focused on answering the following questions:

1. What is the average household size of recently built housing developments in Brent?
2. How are private rentals and immigration affecting household size?
3. Is overcrowding a problem in new developments?
4. Are residents satisfied with their housing accommodations?

III.1 Defining the Target Population

Our survey focused on housing developments built within the past five years for the purpose of studying the effects of recent housing policies. In all, 4661 residences were identified in the target population. For the mail survey, a questionnaire was delivered to each residence in the target population. There was no need to survey a smaller sample of the population as the mail survey allowed us the opportunity to reach every residence within the time and resources

allowed. For convenience in conducting the door-to-door interviews, we selected larger developments which could be easily accessed by public transportation.

In Figure 5, a map shows the location of the homes that were surveyed. There was a distribution of homes across the entire Borough, but the majority of homes were located in the southeast. Each blue circle represents one household.

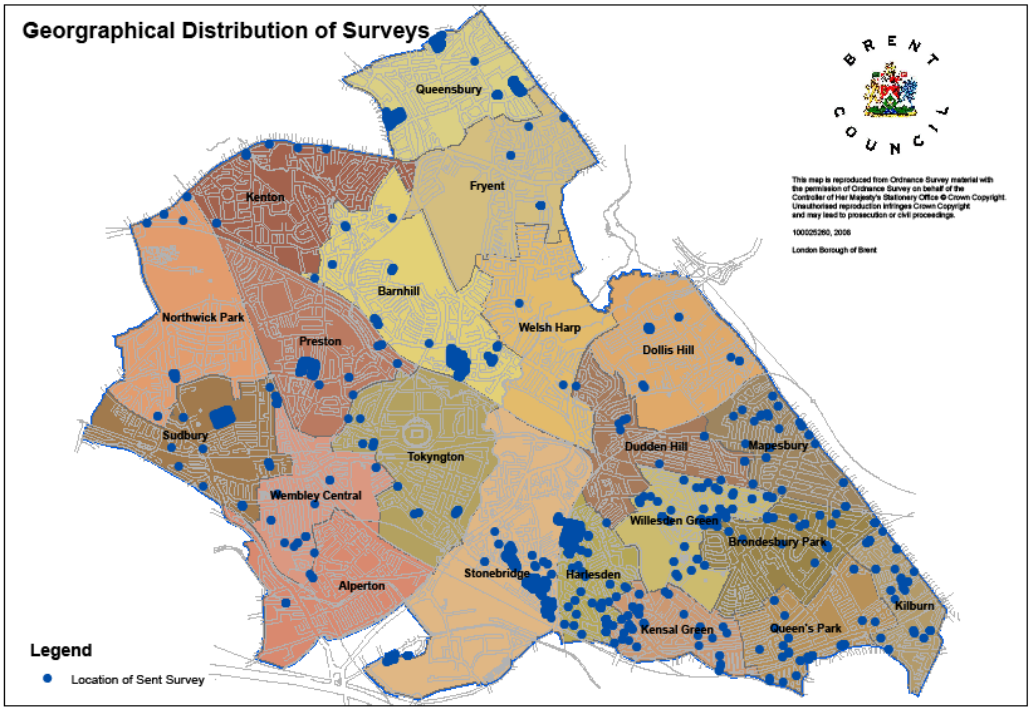

Figure 5: Geographical Distribution of Surveys

III.1.1 Obtaining a Mailing List

The mailing list used to distribute the survey was compiled by Ben Martin, an officer within the Planning Service. Using an internal database, a rough listing of housing developments built within the past five fiscal years (02/03 to 06/07) was assembled. The information obtained

from this database included planning reference numbers, number of units completed, and the address associated with the site at the time planning permission was granted. In order to establish a functional mailing list from the data, the following issues were addressed (Martin, 2008):

- Some addresses of completed properties did not match the addresses to which planning permission was originally granted.
- Major regeneration projects are often built in phases. Only those completed within five years were to be considered.
- In smaller residential schemes, it was necessary to identify those residences built within five years.

In order to verify addresses with planning records, the details of planning permission for each site were reviewed. Each development and its boundaries were identified on a map of the Borough. Once all boundaries were identified, the addresses within were "cut and pasted" into a spreadsheet to form the mailing list. It was important to re-check the addresses, as some of them represented open spaces, roads, and commercial structures not included in the survey (Martin, 2008).

In the case of large regeneration projects which are sometimes completed in sections spanning many years, it was necessary to identify those that had been built within the last five years only. This was done primarily with aerial photographs of these projects. The Planning Service had aerial records from 2001 and 2007. Comparing these, it was possible to see if a residence from 2007 existed in 2001, which would make it older than five years and exclude it from our target population. The aerial photographs were supplemented where possible with development phasing master plans, building control records, and personal knowledge from

other planning officers (Martin, 2008).

Some smaller developments consist of residences built at different times, notably including extensions and conversions. Extensions refer to additional residences built within an existing scheme. Conversions occur when existing residences are subdivided to form additional housing. In these smaller developments, any units which did not appear on current planning records were included in the mailing list. Extensions built within five years were also included. For conversions, where it was clear that a residence had been subdivided within the past five years, that residence was included (Martin, 2008).

Using these methods, a list of 4,661 addresses was compiled, accounting for 98% of the target population. Within this list, 4,569 positive addresses were identified. Of the total mailing to 4,661 addresses, 93 surveys went to non-existent addresses and those surveys were returned by Royal Mail.

III.2 Survey Design

The design of our survey was an important aspect of this project, as it was the main tool through which we gathered our data. The quality of our survey was related to the quality of the data it would provide. To aid in the design of our survey, we consulted survey-writing texts, written by Don A. Dillman (1978), and the London Borough of Wandsworth's recently completed housing survey. The steps we took in designing the overall survey were the formulation of general question topics to determine what we needed to know, the writing of the actual questions, the design of a way to link each returned questionnaire with the geographic location from which it had been returned, and the writing of a cover letter and reminder letter.

We decided upon a two-page maximum length for the questionnaire to make it easy to complete and promote a favorable response.

III.2.1 Question Topics

The first step in designing our mail questionnaire was to determine the general information we needed to obtain. These general topics of interest were household occupancy, tenure, immigration, overcrowding, transportation to work, and resident satisfaction. From these general topics, we could then determine what specifics needed to be known.

From these topics, we determined that it was necessary to know total residents, details of tenure, whether or not residents had recently immigrated into Brent, total number of rooms in the residence, means of transportation to work for each employed person in the residence, and resident satisfaction with various aspects of their house including number and size of rooms, amenity space, and parking availability.

Our survey also featured subjects of general planning significance. These included a differentiation between houses and flats, length of residence at current address, household income, percent of income contributed to mortgage or rent payments, shared housing, number of children in school, and employment.

III.2.2 Question Writing

After establishing goals for information to be obtained, we wrote the survey questions. We used various sources to aid in this process, including relevant survey writing literature by

Dillman (1978) and Wandsworth's New Housing Survey of 2004.

III.2.2.1 Survey-writing Literature

Of the multitude of survey-writing guides available, we focused on Don A. Dillman's Mail and Telephone Surveys (1978) to aid in our writing. This resource was invaluable to the composition of our questionnaire as it thoroughly covered the topic of question writing and focused particularly on common mistakes that should be avoided. The guidelines that we found most relevant were the avoidance of esoteric or unconventional phrases, a balance between vagueness and precision, avoiding bias, and making multiple choice lists mutually exclusive and exhaustive.

We avoided the use of phrases which were not widely understood. For example, in question one of our survey (Figure 6), we sought to distinguish between "purpose built" and "converted" flats. While these terms are common in the vocabulary of a planning officer, it was likely that the average resident would be unclear on the usage of these terms. Dillman highlights this issue in general populations such as ours where there is no shared technical terminology (1978, p. 99). To make the question clearer, we specified "purpose built" flats as a "block of flats" and "converted" flats as a "former houses or commercial buildings." Had we not made the differentiation clear, we would have risked misguided responses or non-response due to respondent confusion.

Q1. Which of the following best describes your home?

☐ House

☐ Purpose built flat (block of flats)

☐ Converted flat (former house or commercial building)

Figure 6: Question: Surveying Houses and Flats

Confronting vagueness means clearly defining terms which may mean different things to different people. In our survey, words like "household" were treated with special care as we were trying to differentiate between couples and family units or other unrelated groups of people within a single residence. On the questionnaire, we defined a household as "a single person, a couple living together (whether married or not), or a family including children or other relatives." We did this to gain knowledge about the number of homes in which unrelated people were living in one residence. A group of students living together, for example, would be excluded from this definition of a household.

Precision complications occur when one seeks information that is too specific. We avoided such problems by offering available responses as ranges instead of requiring exacting specifics. For instance, we asked about the proportion of the household's total income that is spent on rent or mortgage payments (Figure 7). It would be asking too much for a resident to compute the exact proportion of their income which pays rent or mortgage, so we provided four broad ranges to choose from, each in 25 percent increments. This format allowed the respondent to quickly choose the answer that was closest to the actual without tedious mathematics.

Q9. What proportion of your household income (after tax) is spent on rent or mortgage payments?

☐ Less than 25%

☐ 25% to less than 50%

☐ 50% to less than 75%

☐ 75% or more

Figure 7: Question: Rent or Mortgage as a Percentage of Income

Bias was an important consideration, as pressures resulting from social expectations often make respondents uncomfortable and can influence their answers (Dillman, 1978, p. 102). One of our questions, for example, asked about income (Figure 8). We provided multiple choice answers as a range instead of asking for specifics to make it easier for respondents to answer. This way, the respondent was free to answer without revealing their exact income. A person making £5,000 a year, for instance, would select the "Less than £10,000" option and not have to explicitly state their actual earnings.

Q8. What is your household's yearly income before taxes, including all benefits?

☐ Less than £10,000

☐ £10,000 to less than £35,000

☐ £35,000 to less than £50,000

☐ £50,000 to less than £75,000

☐ More than £75,000

Figure 8: Question: Yearly Income

Finally, since our survey consisted of questions followed by multiple choice answers, it was critical to determine possible responses for each question such that they were mutually

exclusive and exhaustive (Dillman, 1978, p. 111).

Mutual exclusivity means that no respondent should find two or more answers which apply to them, with the direction of only choosing one. For example, a respondent may part own and part rent their property. If our question on tenure (Figure 9) did not include this possibility and only had options for rent *or* own, the respondent would have to choose one over the other. As such, they would not be accurately represented. The addition of the part rent, part own response helped make the options mutually exclusive.

Q2. Which best describes the ownership or rental of your home?

- ☐ Someone in my household is the owner (with or without mortgage)
- ☐ Part own/part rent (shared ownership)
- ☐ Rented from a housing association or council
- ☐ Rented from a private landlord
- ☐ Sub-rented from another person in my home

Figure 9: Question: Tenure

Exhaustiveness refers to the listing of all possible responses for a given question. If all possible responses are not listed, there will be respondents who cannot answer questions for which their intended response is missing. As such, these respondents will not be represented in the survey results. For example, we asked about transportation methods to and from work (Figure 10). We included as possible responses personal cars, motorbikes, public transportation, bicycles, and walking because we felt that these encompassed all transportation methods that a respondent was likely to use. An "other" category was included as a "catch-all" to account for any choice we may have missed, although it was seldom selected by respondents.

Q17. How do the working people travel to their work place?
(tick all that apply)

Worker	Travel Method					
	Personal Car	Motorbike	Public Transportation	Cycle	Walks	Other
1						
2						
3						
4						
5						

Figure 10: Question: Worker Transportation

III.2.2.2 Modeling the Wandsworth Questionnaire

Because of its relatively high response rate, we assumed that the Wandsworth questionnaire was easy to understand and complete. Within Planning Services, it is generally regarded as one of the most successful housing surveys undertaken in recent years. Additionally, as a housing survey concerned with household features and occupancy, we knew that Wandsworth's questions were relevant to the information needed for our own project. For these reasons, we modeled several of our own questions after those found in Wandsworth's survey.

Our question which asks about age and gender for all residents (Figure 11) follows the same basic format as a similar question on the Wandsworth questionnaire. We felt that this format was clear for the respondent to understand and provided a large amount of information for the space taken on the questionnaire.

Q11. Please state the age and sex of everyone living in your home.

Age	Total Males	Total Females
0 to 3		
4 to 10		
11 to 17		
18-64		
65+		

Figure 11: Question: Total Residents

Also, we modeled our question about total rooms (Figure 12) after a similar question in the Wandsworth survey. Their wording covered all living areas as defined by London Housing (2004). In addition, the way that Wandsworth differentiated between bedrooms and other living areas allowed for a more detailed analysis than a general question about total rooms would have.

Q4. How many rooms in your home?

Bedrooms

☐1 ☐2 ☐3 ☐4 ☐5 ☐More_____
(please state)

Lounge / Living / Dining Rooms or Large Kitchens (Kitchens with room for table and chairs)

☐1 ☐2 ☐3 ☐4 ☐5 ☐More_____
(please state)

Figure 12: Question: Total Rooms

III.2.2.3 Inability to Test Survey Questions

Under normal circumstances, it is beneficial to test survey questions on a small sample before wider distribution. This is done to be sure that all questions are easily understood and interpreted as intended by the survey writer(s). Time constraints made it difficult to test our questionnaire before the survey was mailed. In place of formal testing, the draft survey was

circulated throughout the planning office so that more experienced planning officers could make comments and suggestions.

III.2.3 Identifying Returned Questionnaires

For the purpose of our analysis, we determined that it was necessary to have a way of identifying the residence each completed survey had come from. This allowed us to analyze responses with respect to specific areas on a map of the Borough, a major goal of this project. It also facilitated the sending of reminder letters to only those residences that had not yet responded in order to save paper, time, and postage, and ensured that we wouldn't bother residents that had already completed the questionnaire. The easiest way of accomplishing this was to create a unique ID number for each address in the sample. The unique ID was printed on the questionnaire which corresponded to the ID's address. When questionnaires were returned, we were able to match the result to a specific address using the unique ID on the questionnaire.

III.2.3.1 Ethical Concerns

The practice of unique IDs in surveying raises some ethical concerns. We wanted to be sure that the IDs did not violate the respondents' confidentiality. After a thoughtful discussion with Planning Service officers, we concluded that since the list would only be shared among the Planning Service and IDs would only be used to analyze trends pertaining to geographic areas, not individuals, that confidentiality was not violated. As results were reported, we took care to ensure that no data could be traced back to one household. Additionally, the ability to match responses to the area from which the response was received was vital to our analysis.

When reporting previous area of residence, data for those areas with five or less respondents was not explicitly stated. Instead, we denoted an "X" in place of the number of residents from one of these areas, but included these numbers in our averages, as seen in Table 2. This ensures the anonymity of persons belonging to a small group of respondants.

Table 2: Household Size be Recent Area of Origin

Area of Origin	Responses	Avg Household Size
Brent	338	2.53
Other London Borough	145	2.38
UK-Ireland (Not London)	49	2.17
Asia	11	2.91
Africa	X*	1.80
Australia	X*	2.20
Western Europe	X*	5.50
North America	X*	2.25
Other	X*	1.67
Northern Europe	X*	2.50
Eastern Europe	X*	6.00
Southern Europe	X*	2.00
South America	X*	2.00

III.2.4 Cover Letter

A critical component of the mail survey was the inclusion of a cover letter (See Appendix C: Cover Letter). The purpose of the cover letter is to explain the usefulness of the study, the respondent's importance to the study, and the confidentiality of their responses (Dillman, 1978, p. 165). In addition to these main points, we also introduced ourselves as research students and announced a cash prize draw for completion of the survey. A deadline for submissions to qualify for the cash prize gave respondents three weeks to complete the questionnaire and allowed us

enough time to gather and analyze our results. The cover letter was printed with a Brent Council letterhead and denoted the name and title of Michael Maguire, a manager in the Planning Service and overseer of this study. This provided credibility to our survey and increased the overall likelihood of participation (Dillman, 1978, p. 173).

III.2.4.1 Cash Incentives

Like the Wandsworth survey, we offered a cash prize draw to encourage response. The total amount budgeted was £350, which was allotted into a £100 grand prize, two £75 prizes, and two £50 prizes. These amounts were chosen because we felt they allowed for enough prizes to make winning seem within reach, yet were high enough to generate interest. The incentive was in the form of a random prize draw. Of all the returned surveys, five were chosen at random and the respondents were awarded their prizes. In order to be eligible, the respondent had to provide their name and telephone number for contact purposes. Those who did not provide at least a telephone number were not entered into the draw.

III.2.5 Reminder Letter

Two weeks after the initial mailing, a reminder letter (see Appendix D: Reminder Letter) was mailed to those houses from which we had not yet received a response. Although Wandsworth sent three rounds of reminders as part of achieving their 49 percent response, time constraints allowed us to mail only one. Wandsworth conducted their survey over the course of six months, while we had less than two to complete ours. The reminder letter reinforced many of the same points in the cover letter. We reminded residents of the importance of good data to the planning process, reaffirmed confidentiality of answers, and reminded them of the cash draw.

The deadline for submitted questionnaires was moved, giving respondents an additional week to respond and qualify for the cash prize draw.

III.3 Implementation

After finalizing our questionnaire, our attention turned to the process of implementing the mail survey and door-to-door interviews. In total, 4568 mail surveys were delivered and 10 door-to-door interviews were conducted.

III.3.1 Mail Surveys

The mail surveys were composed of our cover letter, a copy of the questionnaire, and a printed, prepaid return envelope. These were all put into an envelope that was affixed with a label stating the recipient's address.

III.3.1.1 Procedure for Preparing Mail Surveys

The procedure for preparing all materials to be mailed was as follows:

- Each address was printed onto a label along with its unique ID number.
- A survey and cover letter were combined and folded in half, horizontally. The cover letter faced outward, so as to be the first thing the recipient would see.
- A preprinted, prepaid envelope was slid into the middle of the folded cover letter and questionnaire.
- All materials were put into a larger envelope, and a label with an address and ID number corresponding to the survey within was affixed to the outside of the envelope.

- To avoid overwhelming the mail room, surveys were sent out in batches of a few hundred at a time.

The entire packaging procedure was completed by hand, because no machines capable of inserting the return envelopes were available.

III.3.1.2 Mailing Reminder Letters

Because responses could be uniquely identified, we were able to remove addresses from our mailing list as completed questionnaires were returned. As a result, we were able to send our reminders to only those residents who had not yet returned their questionnaire. To conserve time and resources, our reminders were sent without additional questionnaires or return envelopes. We reasoned that most residents interested in the survey would still be in possession of their original questionnaire and return envelope. Additionally, we felt that a resident who had dismissed the survey in the initial mailing was unlikely to be swayed by the reminders. Because there was no return envelope included, we were able to utilize the mail room's automated enveloper. Our reminder letters, complete with preprinted addresses, was automatically folded and placed into a windowed envelope through which the address was visible.

III.3.2 Door-to-door Interviews

The door-to-door interviews were conducted in the days after the initial mailing while we awaited responses. Their purpose was to provide information that could not be gained from the mail questionnaire and to help us gauge how easily the respondents could complete the survey and how they were interpreting our questions.

For the sake of convenience and reduction of travel time, these interviews were conducted in large developments near the Brent Council offices. We focused on two developments in particular, Wellspring Crescent and Chaulkhill Road. In these interviews, we administered a questionnaire identical to those sent in mailings, with the addition of supplemental questions that did not fit on the mail questionnaire (see Appendix E: Supplemental Questions). The supplemental questions were written to further elaborate on the adequacy of housing accommodations, focusing on refuse space, space for storing bicycles, and usage of balcony space.

Equipped with a listing of the residences we were interviewing and the ID numbers we had assigned those residences, we marked each completed survey with its ID to be able to analyze them geographically along with mail responses.

For the sake of safety, we conducted these interviews in pairs. Additionally, the door-to-door interviews were conducted during the hours of 4pm and 6pm, when people were likely to have returned from work and before it became dark.

III.3.2.1 Shortcomings of Door-to-door Interviewing

A total of ten door-to-door interviews were conducted. Ultimately, we decided to abandon this method of data acquisition as we found it to be inefficient, and in many instances not possible. Of the residences interviewed, a majority allowed no front door access to non-residents, making interviews impossible at these locations. After deliberating with planning officers, we determined that the extra data gathered in door-to-door interviewing was not worth the time being spent conducting them. We instead devoted our efforts to inputting and analyzing the mail survey data which we began to receive the day after interviews took place.

III.4 Analysis

As completed questionnaires were returned, we systematically entered the responses into a computerized database where it was organized for analysis. Returned questionnaires were cataloged in binders by order of ID number to provide an easily navigable hard copy of our raw data. Geographic Information System (GIS) software was used to plot our data on a map of the Borough. This important step allowed us to observe Borough-wide as well as local trends.

III.4.1 Questionnaire Database

To organize responses, we utilized a custom-built database using Microsoft Access 2000. The database consisted of four major tables where data was stored:

- A table of addresses where surveys were sent, complete with ID numbers
- A table of survey responses that contains a row for each returned survey and columns for each question. Answers to all questions except worker transportation and previous residence were stored here.
- A table for previous residence responses that contains an entry for each response to the previous residence question. These entries were linked to each questionnaire using a response identifier. This allowed any number of responses to this question from any survey. The actual list of places of residence to choose from were stored in a separate table to keep the data normalized.
- A table for worker transportation responses that functions similarly to the previous residence table.

For a more detailed description of the database's design and functionality, see Appendix G: Database and Application Detail Documentation.

III.4.2 Analysis and Statistical Inference

Once the results were entered into our database, the data were analyzed to discover trends. We used our research questions as the starting point for the analysis. Consider this example regarding one of our own questions about overcrowding: first, we determined what percentage of the respondents lived in an overcrowded home. Next, we investigated trends within the overcrowded respondents in our sample. For example, of overcrowded respondents, we broke them down by ownership type, yearly income, and number of children. These trends could be used by planners in developing future plans. For example, we found that overcrowding was most prevalent in privately rented homes; planners could use this information in deciding what size future privately rented homes need to be.

After the trends were analyzed, statistical inference was carried out to verify their significance. A confidence interval was established to support all claims; the confidence interval was equal to one minus the probability that our result was not representative of our sample population. This added validity to our claims which extrapolate data from our respondents to the rest of the recently constructed housing developments in Brent. Detailed calculations can be found in Appendix H: Inference Calculations.

III.4.3 GIS Analysis

Our data was analyzed using ARCMap software provided by the Planning Service. Because of our ability to tie the data we received to individual addresses, we were also able to map our data on GIS maps of the Borough so we could visualize some of the trends we found. A summary of our GIS figures can be seen in Appendix I: GIS Analysis.

III.5 Summary

Our project consisted of the conduction of a mail survey and personal door-to-door interviews in order to obtain information about household size, immigration, and private rental housing in the Borough of Brent. Using GIS software, we were able to identify and analyze trends in specific areas of the Borough as well as Borough-wide. Our analysis focused on investigating a possible link between immigration and “buy to let” and household size in recently built housing developments.

IV Findings

In this chapter we will present the findings of our survey. This will cover all the relevant statistical evidence we could gather from the mail survey we conducted, and its shortcomings. Many of the data we analyzed were easily comparable to data from the 2001 Census, so many sections will contain comparisons to the Census. The first section gives a summary of the survey's distribution and response rate. The next few sections are divided into analysis based on our research questions, which were presented in the Methodology chapter. The final section describes the limitations of the survey.

IV.1 Survey Distribution and Response

Out of the 4661 questionnaires distributed, 98 were returned due to inaccuracies in the addresses. Assuming there were exactly 4661 households built in the last five years, this would represent a sample of slightly less than 98% of those households. The remaining 4563 questionnaires are assumed to have been delivered, due to the high reliability of the Royal Mail. 788 completed surveys were returned, representing a response rate of 17.3%. Table 3, below, summarizes this data and Figure 13, also below, shows a geographical representation of what sections of the Borough our responses came from. Because of the large amount of homes surveyed in the southeast area of Brent, the southeast also had the largest number of responses.

Table 3: Survey Response Summary

Total Sent:	4661
Total Bad Addresses:	98
Total Recipients:	4563
Total Responses:	788
Response Rate:	17.27%

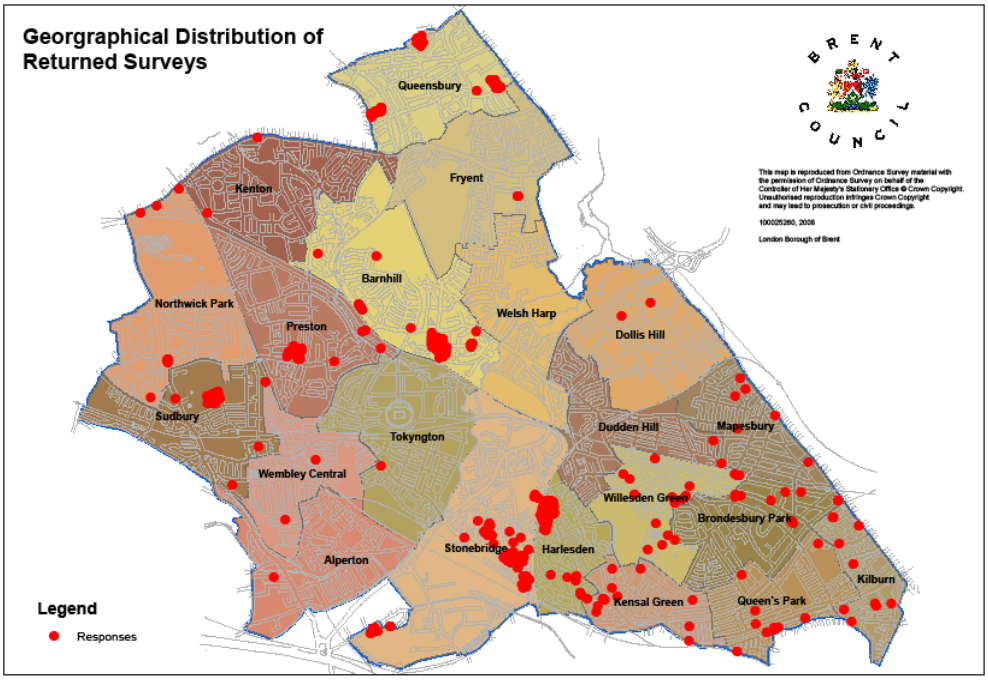

Figure 13: Geographical Distribution of Returned Surveys

Several questions on the survey were subject to non-response. Table 4 gives a summary of the non-response to each of these questions. The questions which do not appear on this list are impossible to have non-response (for example, a "select all that apply" question where none may apply).

Table 4: Question Non-Response Summary

	Non-Responders	*Percentage of Total Responses*
Home Type:	16	2.09%
Ownership Type:	15	1.96%
Tenure:	15	1.96%
Garden:	11	1.40%
Satisf. No. Rooms:	52	6.60%
Satisf. Room Size:	72	9.14%
Satisf. Amenity:	123	15.61%
Satisf. Parking:	107	13.58%
Income:	79	10.03%
Rent Paid:	158	20.05%
Household Size:	70	8.88%
Origin:	164	20.81%
Work Transport:	27	3.43%

IV.2 Home Ownership

One of the main goals of this survey was to try to determine whether the recent increase in private housing rentals and recent changes in immigration patterns were affecting the household sizes of newly developed homes. We asked questions on our survey that would give us data pertaining to these categories.

While our data is limited to a small number of responses, there are interesting findings when comparing much of our data to data gathered by the 2001 Census. Even though the Planning Service has significant reason to believe the 2001 Census data severely under represents the population of Brent, it is the most complete source of data on the Borough as a whole that we could obtain.

In Table 5 below, we compare the data on tenure between our survey and the 2001 Census. The 2001 Census showed that over half of Brent residents owned their homes either

outright or through a mortgage. However, our data showed that in recently completed housing developments only slightly more than twenty percent of people owned their home either outright or with a mortgage, while an additional fifteen percent had shared ownership of their home.

Table 5: Home Ownership

	2008 Household Survey Data:		2001 Census Data:	
Type of Ownership	**Number of Responses**	**Percentage of Total Responses**	**Number of Responses**	**Percentage of Total Responses**
Own	140	18%	54,492	54.50%
Shared Ownership	102	13%	1,435	1.44%
Private Rental	124	16%	23,881	23.88%
Affordable Housing	382	50%	18,172	18.17%
Sub-Rental	1	0.1%	NA	NA

The percentage of private rentals in the new developments was also lower, roughly sixteen percent, when compared to the almost twenty four percent found in the 2001 Census. We expected to see an increase in private rentals because of the emergence of the "buy to let" market however, because our sample was of new housing developments, most of which were built to be affordable housing, the number of private rentals has actually decreased since 2001.

IV.2.1 Home Ownership and Household Size

We found that homes that were privately rented have a higher average household size than homes that are owned by the occupants, as demonstrated in Table 6.

Table 6: Household Size by Home Ownership

Ownership Type	Avg Household Size	Number of Responses	Percentage of Total Responses
Own	2.12	131	17%
Shared-Ownership	2.02	97	13%
Private Rental	2.52	116	15%
Affordable Housing	2.75	332	43%
Total Average	2.47	690	

Note: Response totals are lower in this table, because respondents needed to respond to the household size question in addition to the ownership question to be represented in this figure

This table shows that the average household size in privately rented houses is 2.52 persons per household, which is slightly higher than the average for all respondents, 2.47 persons per household. Also, affordable housing has an average household size, 2.75 persons per household, which is higher than the average.

IV.3 Household Size of Recent Migrants

Recent migrants, those entering the UK within the last five years, were expected to have a larger household size because it was theorized that several migrants would travel to London together, and in turn live together. Eastern Europeans were expected to have the greatest effect, but unfortunately not enough responses were generated from any one area to make a statistically significant claim about a specific group of recent immigrants. Table 7 shows the raw household data collected broken down by areas of origin.

Table 7: Household Size by Recent Area of Origin

Area of Origin	Responses	Percentage of Total Responses	Avg Household Size
Brent	390	51%	2.56
Other London Borough	165	21%	2.35
UK-Ireland (Not London)	55	7.2%	2.17
Asia	14	1.8%	3.00
Africa	8	1.0%	1.71
Australia	X	X	2.20
Western Europe	X	X	4.80
North America	X	X	2.20
Other	X	X	5.50
Northern Europe	X	X	1.67
Eastern Europe	X	X	2.50
Southern Europe	X	X	2.00
South America	X	X	2.00

* X is shown to protect respondent confidentiality in the case of a low number of respondents

Because most of the trends shown in this data are not statistically significant, all recent immigrants were grouped into one category, and all those who have been in the UK for the last 5 years were grouped into another. This showed that recent immigrants do have a higher household size, with 87% confidence. This is generally not enough confidence to make a strong claim, but may warrant further study. Table 8 shows the household size of recent immigrants and those who have been in the UK for at least 5 years.

Table 8: Household Size Summary of Recent Immigrants vs Others

	Number of Responses	Avg Household Size
UK Residents of 5+ years	612	2.55
Immigrants within last 5 years	46	3.04

IV.4 Overcrowding in New Housing

Our survey data exhibits many interesting trends related to overcrowding in new homes in Brent. In general, Brent's newly developed homes are more overcrowded than the homes

surveyed in the 2001 Census. Table 9 shows that over twenty-seven percent of the newly developed homes fell under the category of overcrowded (more than one person per habitable room) compared to less than nine percent of homes found to be overcrowded by the 2001 Census. However, a smaller percentage of homes were found to be severely overcrowded (more than 1.5 persons per habitable room). 2.37 % of newly constructed homes were found to be severely overcrowded compared to 3.79% in the 2001 Census. The results of a two hypothesis tests show that we are extremely confident that these trends are representative of all new housing developments; i.e. was are extremely confident that overcrowding has increased in recently constructed housing developments from the borough wide figures in the 2001 census, and that severe overcrowding has decreased.

Table 9: Number of Overcrowded Homes

	2008 Household Survey Data:		**2001 Census Data:**	
Number of Persons per Room	**Number of Responses**	**Percentage of Total Responses**	**Number of Responses**	**Percentage of Total Responses**
Less than 1	474	68.9%	91,213	91.22%
1 to 1.5 (Overcrowded but not severely)	187	27.18%	4,988	4.99%
1.5 or more (Severely overcrowded)	27	3.92%	3,790	3.79%
More than 1 (Overcrowded and severely)	214	31.10%	8,778	8.78%

Other trends were investigated to try to relate overcrowding to a number of other variables. Our first analysis was between overcrowding and income. Our results show that as the income of a household rises, overcrowding decreases. The data in Table 10 suggest that the proportion of overcrowded and severely overcrowded homes can be related to income.

Table 10: Overcrowding by Household's Income

Overcrowding by Income Income Range	Number of Overcrowded Homes	Number of Severely Overcrowded Homes	Percentage of Overcrowded Homes	Percentage of Severely Overcrowded Homes
<10k	50	8	29.41%	33.33%
10k-35k	73	14	42.94%%	58.33%
35k-50k	27	1	15.88%	3.70%
50k-75k	13	0	7.65%	0.00%
>75k	7	1	4.12%	3.70%
Total	170	24		

Note: Number of responses in tables may not match previous totals due to non-response

Statistical analysis of our data have made us extremely confident that having children increases the number of persons per-room. We found that on average, households with two or more children are overcrowded, suggesting that there is not enough large housing be made available to large families. The trend between number of children and persons per room can be seen in Figure 14 below.

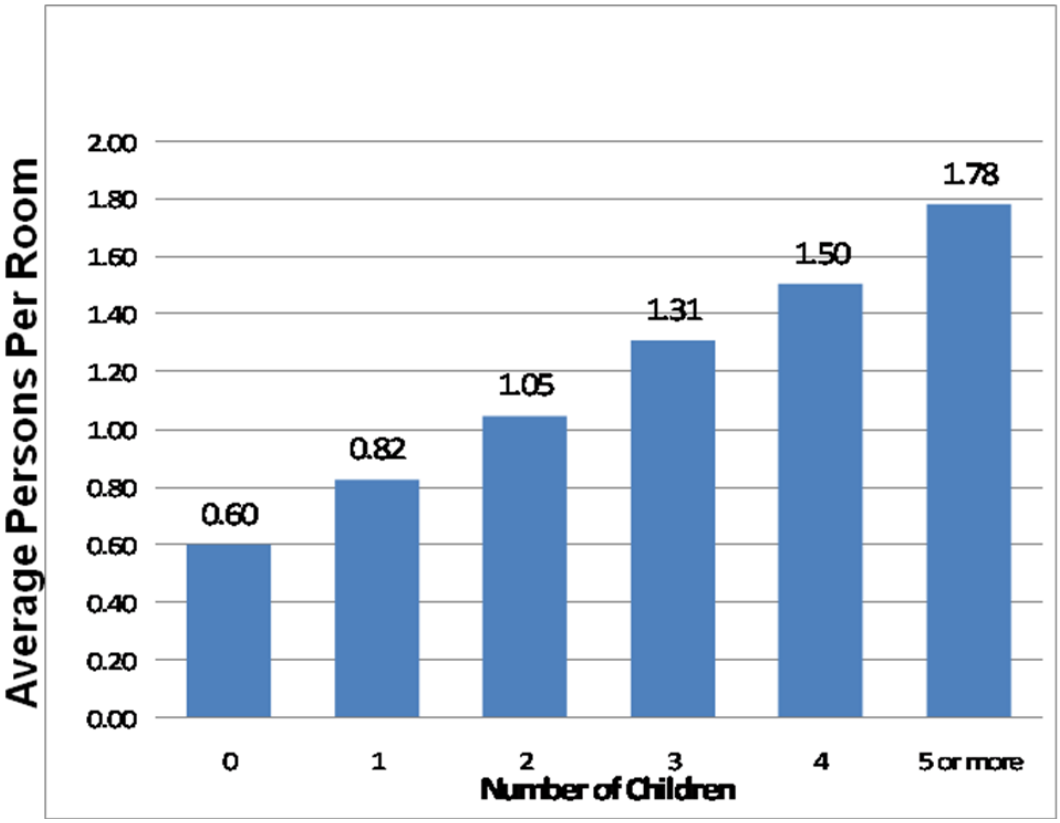

Figure 14: Average Persons per Room by Number of Children

Our data also show that home ownership affects overcrowding. In general, private rentals or affordable housing were much more commonly overcrowded than homes that were owned outright, as shown in Table 11.

Table 11: Overcrowding by Ownership Type

Type	Number of Respondents that had Overcrowded Homes	Number of Respondents that had Severely Overcrowded Homes	Percentage of Homes of this Ownership Type that are Overcrowded	Percentage of Homes of this Ownership Type that are Severely Overcrowded
Own	20	3	14.29%	2.14%
Shared Ownership	23	2	22.55%	1.96%
Affordable Housing	104	14	27.23%	3.66%
Private Rental	38	8	30.65%	6.45%
Sub-Rent	0	0	0.00%	0.00%
Total	185	27		

IV.5 Resident Satisfaction

After analyzing the results of our survey, we found several interesting trends related to resident satisfaction. To ease analysis, each satisfaction category was given a number, known as a satisfaction rating, to represent it; a response indicating that the resident was "very satisfied was assigned the value "2," a response of "satisfied" was assigned "1," a response of "no opinion" was assigned "0," a response of unsatisfied was assigned "-1," a response of "very unsatisfied" was assigned "-2," and no response was assigned "-3." Non-response was not included in these analyses. The average value relates to the arithmetic mean of the satisfaction rating. Table 12 shows a summary of residents' satisfaction on each topic addressed.

Table 12: Resident Satisfaction Summary

Satisfaction Category (Satisfaction Rating)	Number of Rooms	Room Size	Amenity Space	Parking Space
Very Satisfied (2)	31.27%	22.76%	15.17%	17.36%
Satisfied (1)	42.72%	39.01%	28.79%	30.08%
No Opinion (0)	5.73%	8.20%	14.24%	13.95%
Unsatisfied (-1)	9.75%	14.86%	16.56%	12.71%
Very Unsatisfied (-2)	4.95%	6.66%	11.15%	13.18%
No Response	5.57%	8.51%	14.09%	12.71%
Average Satisfaction Rating	0.907	0.616	0.236	0.300

The average satisfaction rating results indicate that residents are fairly satisfied with all aspects of their homes. The areas in which residents were least satisfied were their amenity and parking spaces. Possible ways of improving residents' satisfaction could be to require developers to construct improved amenity space, such as a garden or balcony, and to provide more parking spaces in new developments.

To investigate the importance of a garden or balcony to residents' satisfaction with their home, we performed two other analyses. First we investigated if there was a correlation between respondent satisfaction and whether or not the respondent had a garden. The results of this analysis are summarized in Table 13.

Table 13: Resident Satisfaction Related to Garden Space

Garden Type	Amenity Space Satisfaction
Private	0.436
Communal	0.564
No Garden	-0.120

This analysis also used the satisfaction rating to represent the respondents' level of satisfaction. The average satisfaction rating for amenity space was computed for respondents who indicated that they have a private garden, communal garden, or no garden.

This analysis suggests that having a garden does improve residents' satisfaction with their amenity space. It is important to note that residents' satisfaction is not based on the garden being private or communal (communal gardens actually have higher satisfaction ratings) but only if they have any sort of garden.

A similar analysis was performed comparing respondent satisfaction to the availability of other amenity space, such as a large balcony, patio, private roof terrace, or communal roof terrace. These results are summarized in Table 14.

Table 14: Resident Satisfaction Related to Amenity Space

Amenity Type	Average Satisfaction with Amenity Space (with amenity type)	Average Satisfaction with Amenity Space (without amenity type)
Large Balcony	0.391	0.175
Patio	0.438	0.210
Private Roof Terrace	0.750	0.225
Communal Roof Terrace	0.211	0.237

This analysis found the average respondent satisfaction with their available amenity space based on whether or not they had the extra amenities listed above. As in the previous analyses, a satisfaction rating was used.

It is clear that having any of the extra amenities listed above greatly increases residents' satisfaction. Having a private roof terrace increases the satisfaction the most and providing one in each future development could be a strategy to ensure resident satisfaction. It is important however to evaluate the cost impact of each of the listed amenities should before making any

policy decisions.

To investigate the current parking situation, another analysis was done. Its results are shown in Table 15.

Table 15: Parking Summary

Average Cars per Off-Street Parking Space	1.05
Average Parking Spaces per Residence	0.635

This analysis investigated the parking demand by computing the average number of cars per off-street parking spaces, and the average number of parking spaces per residence. To calculate cars per parking space, responses indicating the household did not have a car were omitted. This was done to give a better understanding of parking demand. Currently, there are 1.05 cars per off-street parking space, indicating that while there is a demand for parking, there is nearly enough available. The second figure, average parking spaces per residence, gives an idea of the amount of parking currently being provided. A value of 0.635 was obtained; this suggests that parking is fairly adequate in newly developed housing.

These analyses have limitations because our survey only studied off-street parking, and ignored on-street parking. While off-street parking is optimal, on-street parking is usually necessary in urban areas. If on-street parking was considered, it is unlikely that parking would be an issue across all surveyed units; it is far more likely to be only a localized problem. To gain a more complete knowledge of parking demand, this topic should be investigated in much more detail.

IV.6 Survey Limitations

Every data gathering tool has its limitations, and this survey is no exception. Even after almost two full weeks of question-writing, some respondents were clearly confused on portions of the questionnaire. Also, as with many types of surveys, response bias was an issue. It is also important to mention limitations in our sample selection that limit the future uses of the data collected.

IV.6.1 Question Limitations

Several questions on the survey produced results indicated that the respondents were confused. Because each survey's data was transferred into the data analysis system by hand, we were able to ensure that this had a minimal effect on our results however, certain problems had a larger impact than others. The most common problems are introduced below.

IV.6.1.1 Counting the Number of Rooms in a Home

The question on number of rooms in the respondent's home was slightly flawed. Several respondents simply missed the word "Bedrooms" directly under the question, causing them to report the total number of rooms as the number of bedrooms. This was not a common occurrence. Our results were not significantly affected because this data was primarily used to determine overcrowding. Overcrowding was determined by summing the total number of people in a household and dividing by the sum of the rooms; therefore a resident listing all of their rooms as bedrooms would not have any effect on our results. If an alternative definition of overcrowding was used, i.e. the definition used by Fordham Research in 2003, than this would

have been a larger issue. Under this alternative definition, this report could not necessarily be used to determine overcrowding by this definition.

The second half of the question asks about different types of living areas. A wide variety of proper and improper responses were received on this question. Some simply underlined or circled the types of rooms that they had. Others marked the number boxes below the types of rooms they had. Each of these were easy to correct, and did not cause any major issues.

The questionnaire did not take into account studio apartments, large apartments with only one room which acts as a living and sleeping area. While this would not necessarily give a misrepresentation of overcrowding in a strict sense, it could give misleading results. If the results of this project are investigated further, the omission of studio apartments must be considered when drawing new conclusions.

IV.6.1.2 Counting the Number of Residents in a Home

The placement of this question directly after a question about people outside of one's household living in the same house had an unexpected effect. Many people crossed the table out or wrote "N/A" or "None" over it. All of these responses are clearly incorrect; there must be someone living in the home to fill out the survey. These responses were treated as non-response to the question, and therefore did not affect the result.

Many people did not count themselves when answering the question. This became immediately apparent in cases were several young children were listed with no one old enough to take care of them. We also noticed this in cases where only a male was listed, but the respondent provided their name prefixed with "Ms." or "Mrs." (or vice-versa for "Mr."). This type of response created a dilemma, because there are several scenarios that could have caused these

problems. It is possible that the respondent actually noted the proper total number of residents in their home, but didn't put them in the right boxes. For example, someone could accidentally list occupants as the opposite gender or the wrong age. It was decided that tampering with the data would invalidate the conclusions of this study, and that the inaccuracies from respondents were not common enough to affect the data significantly. Most inaccuracies did not affect the total count of people in the home, and therefore would not affect the results of this study.

IV.6.1.3 Misrepresentation of Retired Persons

There was no place to indicate that a respondent is retired on the questionnaire, which caused confusion. This problem affects the accuracy of data regarding employment, because people who answered "not employed" may actually be retired, not unemployed. Pensioners also often provided written comments on the income section, stating they did not know their income because it came from pension credit. Although employment was not considered in any of our analyses, this limitation must be considered when analyzing our results in the future.

IV.6.2 Sample Limitations

Distributing a questionnaire which asks about satisfaction naturally introduces bias into the results because people who are not satisfied are far more likely to respond that those who are. This is because unsatisfied respondents feel that they have something to gain by responding, an improvement in their current situation, while those who are satisfied have no incentive to reply. Also, this survey had added bias because of the high unemployment levels in Brent. Because so many potential respondents are unemployed, they have much more time to fill out our questionnaire than those who are working. It is not likely that these biases affected our results

very much, as resident satisfaction was fairly high, and none of our analyses focused on employment.

Also, because new housing developments have unique characteristics from the rest of the Borough, the results of this study cannot be applied borough wide. The results of this study should only be used to study very recent housing trends, and would be most useful in determining policies for future housing development.

IV.7 Survey Response

Our survey achieved a response rate of 16.74%, which exceeded our goal of 10%. We feel that one reason we were able to achieve such a high response rate was because we issued a reminder letter. A graph of responses received each day can be seen below in Figure 15.

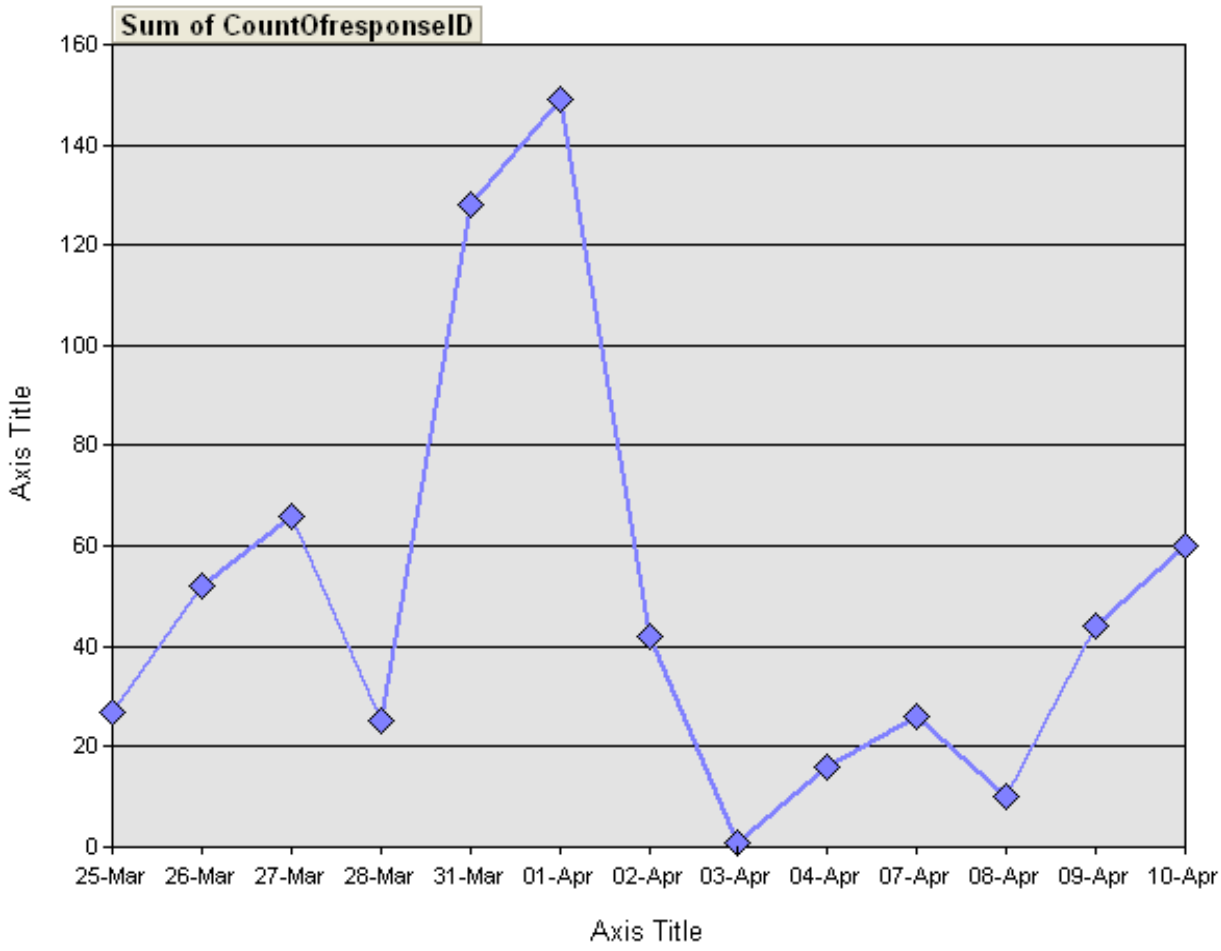

Figure 15: Responses By Date

This graph shows that we began receiving responses on 25, March. After about one week, our daily response rate was near zero. On 4, April we mailed all non-respondents a reminder letter. We attribute the rise in daily response seen at the end of the graph to the reminder letters, and feel that they were very useful in helping us to achieve our response rate.

IV.8 Summary

In this chapter we analyzed data pertaining to tenure, immigration, household size, overcrowding, and resident satisfaction in new housing developments in Brent. We found that in

these new developments, a high percentage of dwellings are affordable housing compared with the 2001. In new developments, household size varies significantly according to tenure. Affordable housing has the highest average household size, followed by private rentals. Shared ownership homes and homes owned by the occupier had significantly lower household sizes.

Recent immigrants did not seem to compose a significant portion of new housing residents. Interestingly however, the average household sizes were larger for immigrants than for residents who had been living within the UK for at least five years.

Overcrowding appears to a bigger problem in new developments than in the residences polled in the 2001 Census. The overall overcrowding rate we found was 27% compared to the Census' figure of 8.78%. Overcrowding is most prevalent in affordable housing, and in households where total income is between £10,000 and £35,000.

Resident satisfaction is most positive in the areas of number of rooms and room size. In the areas of amenity space and parking, however, responses were not as strong. Satisfaction with amenities had a strong correlation with the availability of a garden or other amenity space.

We have also discussed some of the drawbacks of our survey and a caveat about this study. In many cases, not all questions were understood correctly, especially the total rooms and total residents questions. The scope of this project, on newer housing developments, did not lend itself to generalizations about the borough as a whole. The high proportion of affordable housing and generally smaller dwellings made our population not representative of other residences in the borough.

V Conclusions

This chapter presents conclusions based on the findings of our study. We first present the conclusions we have drawn from our findings, and then deliver recommendations based on those conclusions in the following section. The topics which will be addressed are household size, overcrowding, resident satisfaction, and surveying techniques.

V.1 Household Size

The results of our household analysis show that rental housing units have a larger average household size, 2.75 persons per home for social rentals and 2.56 for private rentals, than the average for all recently completed developments, 2.47 persons per home.

Our results also show that recent migrants to the Borough have a larger average household size, 3.04 persons per home, than people who have lived in the UK for the past five years, 2.55 persons per home. A statistical inference procedure was carried out to confirm these results, and yielded a confidence level of 84%.

V.2 Overcrowding

Our data show that the proportion of overcrowded homes in recently developed homes (27.18%) is significantly higher than the proportion of overcrowded homes borough wide in 2001 (4.99%). After completing a statistical significance, we are extremely confident that the true proportion has increased, and that this is not a trend only taking place in our data. Our data

also show that the proportion of severely overcrowded homes in our survey (3.92%) is roughly the same as the borough wide data obtained in the 2001 census (4.35%). We have also shown that overcrowding is especially prevalent in rental housing. 36.72% of privately rented homes and 31.66% of social rental homes are overcrowded. We are also very confident that these trends are happening in all recently developed homes, not only in the ones which responded to our survey.

The number of children in a home affects whether it is overcrowded. We showed that, on average, homes with two or more children are overcrowded. This potentially has detrimental effects on families.

Our data also show that respondents that were living in overcrowded or severely overcrowded homes usually (66% of overcrowded responses) indicated that they were satisfied or very satisfied with the number of rooms in their home. This is an unusual trend because one would expect people living in overcrowded conditions to want more space in their homes.

V.3 Resident Satisfaction

After completing our resident satisfaction analysis, we have concluded that residents are generally have satisfied or neutral feelings about their homes. The areas that we studied with the lowest satisfaction ratings were amenity space and parking space.

V.4 Survey Conclusions

After completing our survey, we have concluded that the use of a reminder letter greatly

improved our response. Figure 14 on page 62 of this report shows the number of responses we received by date. After approximately two weeks, our number of responses per day was nearly zero. Shortly after mailing out a reminder letter, our responses per day increased; indicating that the reminder letter was useful.

VI Recommendations

This chapter presents recommendations based on our conclusions from the previous section. Topics include a proposed study of overcrowding in new homes, a proposal to investigate the definition of overcrowding, a proposal for making new homes larger, a proposal for increasing resident satisfaction with additional amenity space, a proposed study on the households of recent migrants, and recommendations for carrying out successful postal surveys.

VI.1 Study of Overcrowding

Our findings showed that while people in newly developed homes were generally more overcrowded than the Borough-wide measurement from the 2001 census, they were still satisfied with the number of rooms in their homes. This was interesting because one would think that an overcrowded home would most likely contain residents that are unsatisfied with their number of rooms.

We recommend that more research be pursued to investigate the negative effects of overcrowding in new housing developments. Any possible effects should be investigated to provide planners with an idea of how large of a problem overcrowding in newly developed homes is and how it affects residents' lives.

VI.2 Investigate the Definition of Overcrowding

We recommend that the definition of overcrowding be investigated. The definition used

in this report was a household in which there are more residents living there than there are habitable rooms; this definition is used by the British National Government. There is another definition used by Fordham Research, an outside consultant hired by the Brent Planning Service in 2003. Their definition was having more residents in a home than there are bedrooms (Fordham Research, 2004.) Both of these definitions have limitations; the one used by the British government suggests that a household where someone has to sleep in a large kitchen is not overcrowded. Many people living in this situation are likely to disagree. The definition used by Fordham Research suggests that a household where there are an adequate number of bedrooms for everyone living there to have personal space, but a husband and wife share a bedroom, is an overcrowded home. This also is not likely to be viewed by residents as an overcrowded home. At a minimum, these definitions should be standardized so that overcrowding figures are easily comparable. Optimally, a new definition would be formulated that would avoid the limitations listed above.

VI.3 New Homes Need to Be Larger

Based on our findings we suggest that new housing needs to be larger in size and also contain more rooms. We have shown that overcrowding is significantly higher in new housing that it was Borough-wide in 2001. Larger homes is an especially important topic for affordable housing. This is based on the idea that affordable housing was in general more overcrowded than other types of housing. We also found that affordable homes had more children per household, which causes a larger average household size and significantly increases the chance of overcrowding.

Building larger homes would start to help solve the issue of overcrowding, an issue that each London Council must address if it is to decrease significantly across London over the coming years (London Councils, 2006). Larger homes would also allow for more amenity space, which is addressed below.

Currently, family housing is defined as housing with two or more bedrooms (UDP, 2004). Some planners currently feel that this definition should be changed to three or more bedrooms (Brent LDF, 2007). We support this change because our findings show that most of the overcrowded homes are family homes containing two or more children.

VI.4 New Housing Needs to Provide Better Amenity Space

Another important finding of our report was that many Brent residents are least satisfied with their amenity space. We also found that by including something as simple as a communal garden, resident satisfaction was greatly improved. Because of these findings, we suggest that all future housing be built with amenity space in mind, and that homes have access to a communal garden whenever possible, as the effects on residents' satisfaction with a property greatly increase. In a situation where the is not enough ground space for a garden, other amenity space, such as patios or balconies large enough for a table and chairs, should be considered as alternatives.

VI.5 Why Migrant Households tend to be Larger

Our survey also found that migrant families, i.e. families which moved into Brent within

the last five years, had a larger average household size than residents who had lived within Brent for the past five years. Unfortunately, our survey provided no information as to why this trend occurred.

We recommend that an extended study be conducted which looks into why immigrants are moving to Brent and why they tend to have larger households. The study would need to pay close attention to what type of homes migrants are moving into, what type of ownership migrants prefer and what characteristics of the area they moved into attracted them to move there.

VI.6 Postal Survey Design and Implementation

Response rate is a major aspect to the success of a survey. A survey must achieve a response rate that allows the entire sample to be represented by the data acquired. Because of this, our study sought to achieve a response rate of over ten percent, which we surpassed through proper survey design and the use of a reminder letter.

We set the following stipulations on our survey: the survey must not be more than two pages long (front and back of one sheet of paper), all questions must be understandable, the results must be kept confidential, a random prize draw would be offered to those who completed the survey, and a reminder letter would be sent out to help boost the response rate.

We recommend that these procedures be followed in future postal surveys. Providing a short survey increases the likelihood of residents responding because they do not need to invest too much time in it. We strongly believe that our response rate improved because of the mailing of the reminder letter, and it was very easy to produce the letters and then mail them out.

We also recommend ensuring that there is an adequate amount of time for the survey to be carried out. Because of time constraints, only one round of reminder letters was able to be sent out, and they did not include another copy of our survey or another return envelope. This caused many respondents to call the planning service requesting another copy of the survey, and possibly discouraged other potential respondents from replying at all. We believe that if several reminder letters had been sent, and they each included new copies of our survey and return envelopes, our response rate would have increased greatly.

VI.7 Summary

The results of our survey identified overcrowding as a problem in recent developments, and have suggested that planners consider making policies that require developers to build larger homes. Also, we found that having additional amenity space, such as a garden, greatly increases residents' satisfaction with their home. This conclusion also suggests that planners require developers to provide gardens, or some other type of amenity space, in their developments. It was determined that recent immigrants have larger household sizes than people who have lived in the United Kingdom for more than five years, and we suggest that possible causes and implications of this be researched. Finally, we have learned valuable information about conducting a mail survey, and have made the suggestions of ensuring there is an adequate amount of time to carry one out properly, and using reminder letters to increase response. We hope that this information is helpful to the Brent Council. We believe that the information obtained in this project will not only aid planners in developing new planning policies, but will also assist them in future research projects.

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VIII Appendix A: Project Schedule

Project Schedule:	Week of:						
	10-3 to 16-3	17-3 to 23-3	24-3 to 30-3	31-3 to 6-4	7-4 to 13-4	14-4 to 20-4	21-4 to 24-4
Write report							
Develop and test questionaire							
Mail questionaires							
Door to door interviews							
Develop database							
Input survey data into database							
Analyze Data							
Mail Reminder Letters							
GIS Analysis							
Final presentation to our sponsor							

IX Appendix B: Questionnaire

See the next two pages. The survey was printed double sided for distribution, but is shown here as two separate pages.

Brent Housing Survey 2008

Part 1: This section asks questions about your home and household. For the purpose of this survey a household can consist of a single person, a couple living together (whether married or not), or a family including children or other relatives.

Q1. Which of the following best describes your home?

- ☐ House
- ☐ Purpose built flat (block of flats)
- ☐ Converted flat (former house or commercial building)

Q2. Which best describes the ownership or rental of your home?

- ☐ Someone in my household is the owner (with or without mortgage)
- ☐ Part own/part rent (shared ownership)
- ☐ Rented from a housing association or council
- ☐ Rented from a private landlord
- ☐ Sub-rented from another person in my home

Q3. How long have you lived at this address?

- ☐ Less than 1 year
- ☐ 1 year to less than 3 years
- ☐ 3 years or longer

Q4. How many rooms in your home?

Bedrooms

☐1 ☐2 ☐3 ☐4 ☐5 ☐More_____
(please state)

Lounge / Living / Dining Rooms or Large Kitchens
(Kitchens with room for table and chairs)

☐1 ☐2 ☐3 ☐4 ☐5 ☐More_____
(please state)

Q5. Do you have a garden?

- ☐ Yes, a private garden
- ☐ Yes, a communal garden
- ☐ No garden

Q6. Do you have any other amenity space?
(tick all that apply)

- ☐ Balcony (with room for table and chairs)
- ☐ Patio
- ☐ Private roof terrace
- ☐ Communal roof terrace

Q7. How satisfied are you with your home's number of rooms, room sizes, amenity space (gardens /balconies) and parking space?

	Very Satisfied	Satisfied	No Opinion	Unsatisfied	Very Unsatisfied
No. of Rooms					
Room Size					
Amenity Space					
Parking Space					

How could your home be made more satisfactory?

Please state:_____

_____

_____
(attach additional sheets as needed)

Q8. What is your household's yearly income before taxes, including all benefits?

- ☐ Less than £10,000
- ☐ £10,000 to less than £35,000
- ☐ £35,000 to less than £50,000
- ☐ £50,000 to less than £75,000
- ☐ More than £75,000

Q9. What proportion of your household income (after tax) is spent on rent or mortgage payments?

- ☐ Less than 25%
- ☐ 25% to less than 50%
- ☐ 50% to less than 75%
- ☐ 75% or more

Q10. How many people do you share your home with who are not part of your household?

☐None ☐1 ☐2 ☐3 ☐4 ☐More_____
(please state)

Brent Housing Survey 2008

Part 2: This section contains questions that apply to everyone with whom you live whether they are in your household or not.

Q11. Please state the age and sex of everyone living in your home.

Age	Total Males	Total Females
0 to 3		
4 to 10		
11 to 17		
18-64		
65+		

Q12. How many children (3-17years) in your home attend a school or nursery in Brent?

☐None ☐1 ☐2 ☐3 ☐4 ☐More_____
(please state)

Q13. How many children in your home attend a school or nursery outside of Brent?

☐None ☐1 ☐2 ☐3 ☐4 ☐More_____
(please state)

Q14. For every person in your home, list where they lived immediately before coming to Brent. If the person has lived in Brent for five or more years, list Brent. If the person has lived outside of Brent but within London, state the borough. If the person has lived outside of London, state the country.

Person	Previous Living Area or Country
1	
2	
3	
4	
5	
6	
7	

(attach additional sheets as needed)

Q15. How many of the people living in your home are employed ?

☐None ☐1 ☐2 ☐3 ☐4 ☐More_____
(please state)

Q16. How many of these people work in Brent?

☐None ☐1 ☐2 ☐3 ☐4 ☐More_____
(please state)

Q17. How do the working people travel to their work place?
(tick all that apply)

Worker	Travel Method: Personal Car	Motorbike	Public Transportation	Cycle	Walks	Other
1						
2						
3						
4						
5						

Q18. How many vehicles (including motorbikes) do you and all the people with whom you live have?

☐None ☐1 ☐2 ☐3 ☐4 ☐More_____

Q19. If you have vehicles, when do you use them?
(tick all that apply)

☐ Monday –Friday during the day

☐ Monday – Friday during the evening

☐ Saturday/Sunday

Q20. How many off-street parking spaces are available to you and all the people with whom you live?

☐None ☐1 ☐2 ☐More_____

Thank you for your help.

Please return your completed questionnaire, in the envelope provided (no stamp necessary) by 9 April 2008.

If you would like to be entered in the prize winning draw (£100 grand prize, two £75 second prizes and two £50 third prizes) please give your name and contact telephone number. This information will only be used to contact you if you are a winner and will not be distributed to any other organization.

Name_____

Telephone No._____

0001

Page 2 of 2

X Appendix C: Cover Letter

See next page.

The Planning Service
4th Floor, Brent House
349 High Road, Wembley
Middlesex, HA9 6BZ

TEL 020 8937 5309
FAX 020 8937 5207
EMAIL douglas.heath@brent.gov.uk
WEB www.brent.gov.uk

ENVIRONMENT & CULTURE

Our Ref: Housing Survey

Dear Occupier

18/3/2008

Brent Housing Survey 2008

Brent Planning Service is undertaking a survey of new homes built in the last five years. This Survey has two main objectives. Firstly, to identify whether residents are satisfied with the size of their homes (number of rooms, etc) and their amenities (gardens, balconies, parking, etc). And secondly, to identify the particular needs of residents, such as the number of children attending nurseries and schools in Brent.

The information provided by this Survey will help the Council to better identify changes in Brent's population and resulting needs for more family and affordable housing, additional schools, health facilities and transport improvements.

This Survey is being undertaken on behalf of Brent Planning Service by a group of students from Worcester Polytechnic Institute (Boston, USA) as part of their academic placement programme. In addition to processing and evaluating the responses to this postal questionnaire, they will also be undertaking a smaller number of more detailed personal interviews.

Completing the enclosed questionnaire should only take a few minutes. **All responses to the survey will be treated as confidential**. The published Survey will not identify any individual's personal details.

As a thank you for your help we are offering **five prizes** for returning completed questionnaires, **a £100 grand prize, two £75 prizes, and two £50 prizes**. All returned questionnaires, with a contact name and telephone number, will be entered into a **random prize draw**. Winners will be notified by telephone no later than 26th April 2008.

Please return your questionnaire in the enclosed addressed envelope (no stamp required) as soon as possible but no later than **9th April 2008**. If you have any questions regarding the survey or the study, please contact Douglas Heath on 020 8937 5309 ext. 5204.

Thank you very much for your help.

Sincerely,

James Cialdea
Douglas Heath
Ryan Lawrence
Anthony Richardson

On behalf of,
Michael Maguire
Brent Planning Service

XI Appendix D: Reminder Letter

See next page.

The Planning Service
4th Floor, Brent House
349 High Road, Wembley
Middlesex, HA9 6BZ

TEL 020 8937 5309
FAX 020 8937 5207
EMAIL michael.maguire@brent.gov.uk
WEB www.brent.gov.uk

ENVIRONMENT & CULTURE

Our Ref: Housing Survey

3/4/2008

Dear Occupier

Brent Housing Survey 2008 Reminder

Recently we have sent you a questionnaire about your household, but have not had a reply from your residence. We have already received many returned questionnaires, but we hope to obtain as high of a response as possible so a true representation of newly developed homes is acquired. This will enable the Planning Service to work more effectively towards "building a better Borough".

Completing the previously sent questionnaire will only take a few minutes. **All responses to the survey will be treated as confidential**. The published survey will not identify any individual's personal details.

We care about your opinion, so as a thank you for your help we are offering **five prizes** for returning completed questionnaires, a **£100 grand prize, two £75 prizes, and two £50 prizes**. All returned questionnaires, with a contact name and telephone number provided, will be entered into a **random prize draw**. Winners will be notified by telephone no later than 26th April 2008.

Because of the Easter holiday weekend, we understand you may not have had the opportunity or time to complete the survey so we have decided to extend the deadline for the prize draw. Please postmark your questionnaire in the envelope that was enclosed in the previous mailing (no stamp required) as soon as possible but no later than **11th April 2008**. If you have any questions regarding the survey or the study, please contact Douglas Heath on **020 8937 5309** ext. **5204**.

If you have already returned a completed questionnaire, then please ignore this letter.

Thank you very much for your help.

Sincerely,

James Cialdea
Douglas Heath
Ryan Lawrence
Anthony Richardson

On behalf of,

Michael Maguire
Brent Planning Services

INVESTORS IN PEOPLE

Brent – building a better borough

XII Appendix E: Supplemental Questions

Development:

Address:

Date:

Time:

Language Barrier?

Who completed survey (Head of household?):

Adequacy of bike storage?

Adequacy of refuse storage?

Adequacy of balcony?

Comments on questionnaire:

XIII Appendix F: Schedule of Mailings

Mar-16	Mar-17	Mar-18	Mar-19	Mar-20	Mar-21	Mar-22
		Survey Mailed	Survey Mailed	Survey Mailed		
Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29
	Door-to-door Interviews					
Mar-30	Mar-31	Apr-01	Apr-02	Apr-03	Apr-04	Apr-05
					Reminders Mailed	
Apr-06	Apr-07	Apr-08	Apr-09	Apr-10	Apr-11	Apr-12
			Initial Survey Due Date		Reminder Due Date	

XIV Appendix G: Database and Application Detail Documentation

This section provides in-depth details about the database and related tools used to organize mailing addresses and analyze the returned surveys.

XIV.1 Overview

Access 2002 (version 10.6501.6839, SP3) was used to build a customized database and related application support. The database is structured into five main data tables and nine tables used to store enumerator options. Queries built on top of the tables allowed for detailed analysis of the ever changing data. The application portion consists of Access forms, reports, and queries linked together by Access's switchboard tool. Options available from the switchboard include: enter new survey results, search for survey result, and various analysis reports and queries.

The data and application were separated into two files. The application file utilizes linked tables to connect back to the data source, which was stored on a central server. Copies of the application file were distributed to each member of the team. This approach allows connections from multiple users simultaneously, and allows development of the application concurrent to data entry without any downtime of the database.

XIV.2 Functional Overview

This section acts as a user guide to the system. The system consists of two files: SurveyResult.mdb contains the user accessible features for the system and links back to the data source, SurveyResult_be.mdb is the backend database file which stores all the data, table definitions, and table relationships. In most cases, users should not open SurveyResult_be.mdb. A warning message will be displayed if SurveyResult_be.mdb is opened, telling the user to consider using SurveyResult.mdb instead.

XIV.2.1 Installation

1) Copy the "SurveyResult.mdb" file to a directory on the user's system. Note: ".mdb" may not be displayed on all systems.

2) Open SurveyResult.mdb with Access 2000 or newer.

3) The Main Menu will be presented, with the Database menu behind. If an error about a missing file appears instead of the main menu, complete the next step, then close Access and try again.

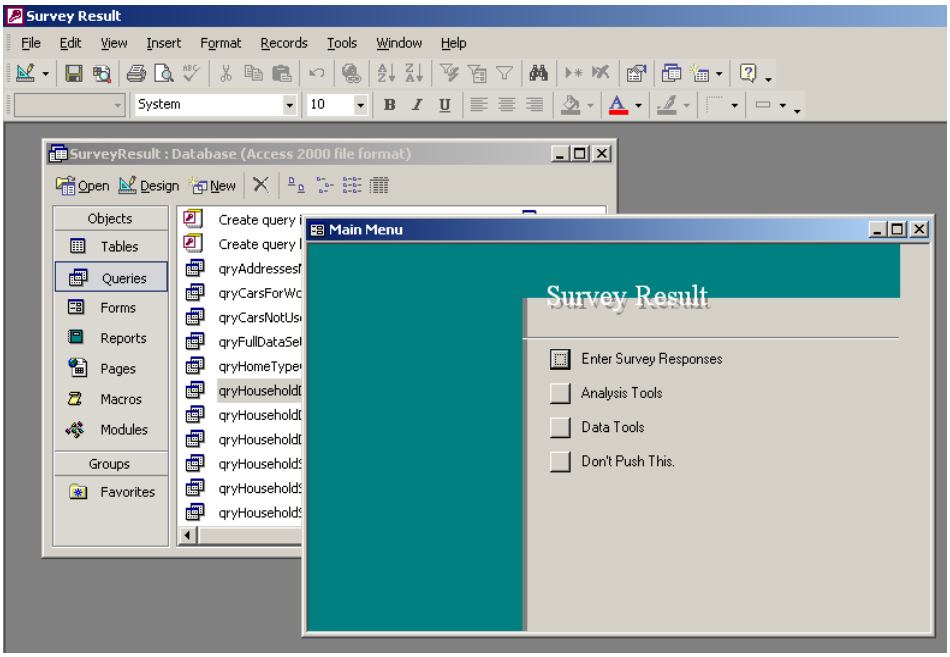


Figure 16: Database Application Main Screen

4) Refresh the linked tables: Tools → Database Utilities → Linked Table Manager. Select All. Ok. Path to SurveyResult_be.mdb may need to be specified if it has moved. Assuming the refresh works, the tables will be refreshed, and the linked table manager can be closed.

XIV.2.2 Navigating the Menu

This is a hierarchical view of menu options and actions.

- Main Menu
  - Enter Survey Results: Allows entry of new returned questionnaires
  - Analysis Tools
    - Survey Response Summary: Report about responses and per-question non response
    - Responses Per Date: Graph to demonstrate how many responses

came in each day

- Generalized Results: Averages of data across all results
- Detail Analysis Options
    - Household Data by Immigration Location: Presents average household data broken up by recent immigration areas
    - Household Size By Tenure: Presents average household size by duration of residence
    - Household Size by Room Count: Presents house hold sizes and room counts
    - Household Data of Shared Housing: Presents household data of shared homes
    - Tenure by Immigration: Presents recent immigration data by duration of residence
- Detect Problem Responses
    - Detect Children-only Responses: Shows all responses that reported only children living in the home
    - Detect Household Size Discrepancies: Shows all responses where the number of responses to the previous residence question (Part 2, Q4) do not add up to the household size (Sum of all responses to Part 2, Q1)

- Data Tools
    - Search for Survey: Allows searching for a survey by address ID, or by response ID.
    - Remap "Other" Locations: Allows previous residence options listed in the "Other" category to be remapped to any other residence option.
- Don't Push This.: It's ok to push this – it is the exit button, added on April Fools day.

XIV.2.3 Navigating the Database Window

This section provides a brief overview of the contents of the database window. For more detailed information on each object, see the following development-targeted sections. Some familiarity with Access is assumed in this section.

XIV.2.3.1 Tables Section

This is where the raw data is stored. Each table is linked back to the data file, which causes any changes to affect the entire system. It is highly recommended that users do not tamper with data directly. Instead, use the "Search for Survey" tool, located in the "Data Tools" menu, which is on the Main Menu. Most data in the tables section is summarized in a report or query that can be accessed from the Main Menu. An exception to this is tblBadAddresses, which holds all the addresses to which mail was undeliverable. Addresses were manually moved from tblAddresses into tblBadAddresses as returned mail was received.

XIV.2.3.2 Queries

This is where summaries of the raw data are stored. Each query is stored within the user application file, but the data within comes from the data file. This means that changing the design of the query will not affect any other users, but changing any data presented by the query will affect the entire system. It is highly recommended that users do not tamper with the data in the queries. Because some queries are not accessible from the Main Menu, it may be necessary to access them directly. It is recommended that the user export the data (File → Export…, then choose Excel from the dropdown at the bottom) instead of editing or analyzing it directly.

XIV.2.3.3 Forms Section

This is where the application screens are stored. It is generally not a good idea to access forms from this section because some features may not be activated properly. Instead, use the options on the Main Menu for the best user experience.

XIV.2.3.4 Reports Section

This is where summaries of data are stored in a safe and viewable form. All reports are

accessible from the Main Menu and have much more detailed descriptions there.

XIV.2.3.5 Macros and Modules Sections

There are no user accessible features in these sections. See the development sections for detailed information about these objects.

XIV.3 System Design Information

This section provides in-depth information about the structure of the system including information about each object in the system and all the relationships between them. Portions of this section assume significant experience with Access and database development.

XIV.3.1 Database Table Structure

This section provides a detailed description about the design of the database structure, including use of each table in the database and how tables are related. The database is designed to maximize the readability of results, to minimize data entry time, and to keep data as normalized as possible. To these concerns, many enumerator tables describe the options of multiple choice questions in three ways: a short-hand key for fast entry, a name field that is short but readable, and a long-hand description that matches text on the survey form. Using enumerators ensures that all options on the survey are represented accurately, and that nothing else can be entered. Places of origin were normalized by keeping all options in a separate enumerator table. Each place of origin is related to one of the migration zones defined in another table. To allow multiple responses to the place of origin question (Part 2, Q4) and the worker

transportation question (Part 2, Q7) those responses were separated into their own tables. The structure is summarized in Figure 17. There is a detailed description of each table in

Table 16.

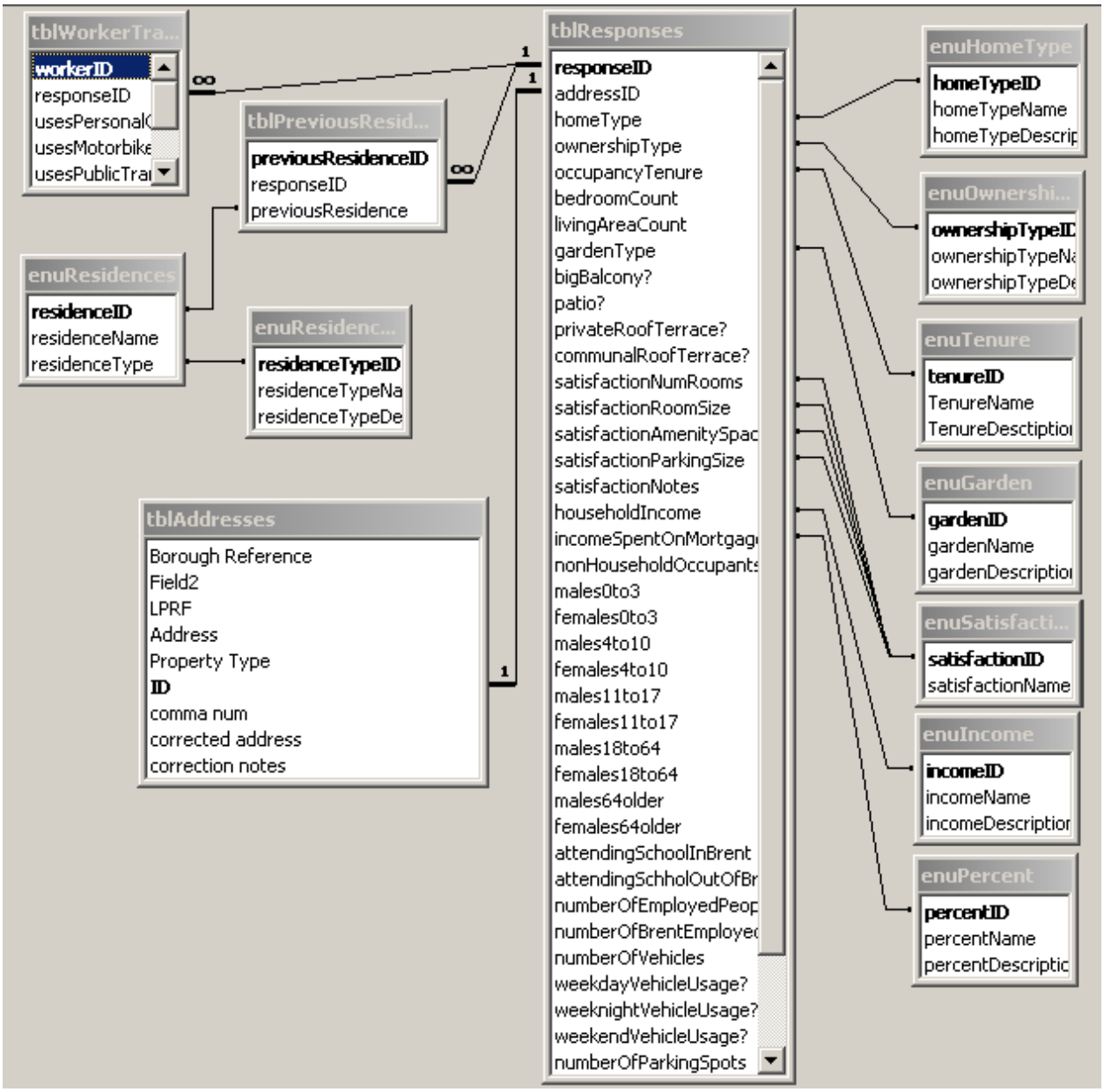


Figure 17: Database Structure

Table 16: List of Database Tables with Detailed Descriptions

Table Name	Table Use	Related Tables
tblAddresses	Stores all addresses that were mailed to. Addresses from which we received "return to sender" mail were removed from this list. All relevant data about the address is also stored here, including the unique ID, and various identifiers from Brent Planning Service	tblResponses, by a 1-to-1 linkage – thus enforcing only one returned survey per address
tblBadAddresses	This is an exact copy of tblAddresses's structure. Addresses which generated returned mail were moved into this table.	None
tblResponses	Stores all data recorded from each survey except answers to the worker transportation question (Part 2, Q7) and the recent migrant question (Part 2, Q4). Each survey response is stored in one row in this table. Each row has an auto-generated unique ID, starting at 10. **Non-responses to individual questions are stores as NULL (technical term for "empty") in the case of most enumerator or text values, "-3" (or "non-response") in the case of satisfaction questions, or -1 in case of numerically answered questions.**	tblAddresses, many enumerator tables (see table relationship figure above)
tblWorkerTransportation	Stores all data recorded from each response to the worker transportation question (Part 2, Q7). Because any number of responses to this question can be received on one survey, it is necessary to store each response to the question in its own row in a separate table. Each row in this table contains one response, which comprises of 1 true/false field for each of the 6 possible choices, and the survey response ID from which it came.	tblResponses, by 1-to-Many, allowing for any number of responses to this question for any one survey response.
tblPreviousResidence	Similarly to tblWorkerTransportation, this table allows any number of responses to the recent migrant question (Part 2, Q4). Each row contains the response ID of the survey the data came from and the location specified. Location choices were normalized in the enuResidences table to make entry and analysis of the data easier.	tblResponses, by 1-toMany, allowing for any number of responses to this question for any one survey response enuResidences, to normalize choices of residence.

enuHomeType	Provides a list of "home types" for selection as answers to Part 1, Q1. Choices include "house", "purpose built flat", and "converted flat"	tblResponses, as an enumerator to the homeType field
enuOwnershipType	Provides a list of "ownership types" for selection as answers to Part 1, Q2. Choices include "Owner", "Shared Ownership", "Social Rental", "Private Rental", and "Sub-Rental"	tblResponses, as an enumerator to the ownershipType field
enuTenure	Provides a list of "tenure lengths" for selection as answers to Part 1, Q3. Choices include: "<1yr", "1-3yrs", "3yrs+".	tblResponses, as an enumerator to the occupancyTenure field
enuGarden	Provides a list of "garden types" for selection as answers to Part 1, Q5. Choices include: "Private", "Communal", "None".	tblResponses, as an enumerator to the gardenType field
enuSatisfaction	Provides a list of "satisfaction options" for selection as answers to Part 1, Q7. Each choice is assigned an integer value for ease of entry and analysis. Choices include: "Very Satisfied", 2; "Satisfied", 1; "No Opinion", 0; "Unsatisfied", -1; "Very Unsatisfied", -2.	tblResponses, as an enumerator to each of the 4 satisfaction fields
enuIncome	Provides a list of "income ranges" for selection as answers to Part 1, Q8. Each choice is assigned a short-hand value for easy entry, a simple name for easy readability, and a long-hand value that is similar to the wording of the survey.	tblResponses, as an enumerator to the householdIncome field
enuPercent	Provides a list of "percentage ranges" for selection as answers to Part 1, Q9. Each choice is assigned a short-hand value for easy entry, a simple name for easy readability, and a long-hand value that is similar to the wording of the survey.	tblResponses, as an enumerator to the incomeSpentOnMortgage field
enuResidences	Provides a list of "previous living areas" and their associated "residence zone" for selection as answers to Part 2, Q4. This allows us to normalize the incoming data for easy analysis and fast entry	tblPreviousResidences, as an enumerator to the previousResidence field
enuResidenceType	Provides a list of "residence zones" that can be assigned to "previous living areas" in order to group them into broad geographic areas.	enuResidences, as an enumerator to the residenceType field

XIV.3.2 Queries

In order to speed up analysis, queries were built before most of the results were available. This allowed us to create the analysis methods and test them before the data came in, and avoided wasted time by making the analysis automated. Table 17 provides a list of queries, the SQL to create them, and what they do.

Table 17: List of Database Queries with Detailed Descriptions

Query Name	SQL	Purpose
qry Addresses Not Received From	SELECT tblAddresses.[Borough Reference], tblAddresses.Field2, tblAddresses.LPRF, tblAddresses.Address, tblAddresses.[Property Type], tblAddresses.ID, tblAddresses.[comma num], tblAddresses.[corrected address], tblAddresses.[correction notes] FROM tblAddresses LEFT JOIN tblResponses ON tblAddresses.ID = tblResponses.addressID WHERE (((tblResponses.addressID) Is Null));	This gives all the addresses from which surveys have not been returned. It was used to facilitate the mailing of reminder letters.
qry Avg Rooms	SELECT Avg(tblResponses.bedroomCount) AS AvgOfbedroomCount, Avg(tblResponses.livingAreaCount) AS AvgOflivingAreaCount, Avg(tblResponses.bedroomCount+tblResponses.livingAreaCount) AS AvgRooms FROM tblResponses WHERE ((([tblResponses].[bedroomCount]+[tblResponses].[livingAreaCount])>0));	Calculates the number of average bedrooms, average living areas, and average total rooms for all respondents that answered the number of rooms question (Part 1, Q4)
qry Cars For Work Transportation	SELECT tblResponses.responseID, Count(tblWorkerTransportation.[usesPersonalCar?]) AS countOfWorkDrivers, First(tblResponses.numberOfVehicles) AS vehiclesInHome, (vehiclesInHome - countOfWorkDrivers) AS unusedCars FROM tblResponses INNER JOIN tblWorkerTransportation ON tblResponses.responseID = tblWorkerTransportation.responseID WHERE (((tblWorkerTransportation.[usesPersonalCar?])=Yes)) GROUP BY	For each response, this gives the number of people in the home reporting that they drive to work, the number of vehicles owned by the home, and the number of "cars not used to get to work" – which is the number of cars, minus the number of car driving workers.

	tblResponses.responseID;	
qry Cars Not Used To Get To Work	SELECT qryCarsForWorkTransportation.unusedCars, Count(qryCarsForWorkTransportation.responseID) AS CountOfresponseID FROM qryCarsForWorkTransportation GROUP BY qryCarsForWorkTransportation.unusedCars;	This is a summary of the above, showing the number of times each amount of unused cars occurs.
qry Full Data Set	SELECT tblAddresses.Address, tblAddresses.[corrected address], tblAddresses.[Borough Reference], tblAddresses.Field2, tblAddresses.LPRF, tblAddresses.[Property Type], tblResponses.addressID, tblResponses.responseID, enuHomeType.homeTypeName, enuOwnershipType.ownershipTypeName, enuTenure.TenureName, tblResponses.bedroomCount, tblResponses.livingAreaCount, enuGarden.gardenName, tblResponses.[bigBalcony?], tblResponses.[patio?], tblResponses.[privateRoofTerrace?], tblResponses.[communalRoofTerrace?], tblResponses.satisfactionNumRooms, tblResponses.satisfactionRoomSize, tblResponses.satisfactionAmenitySpace, tblResponses.satisfactionParkingSize, tblResponses.satisfactionNotes, enuIncome.incomeName, enuPercent.percentName AS incomeSpentOnHousing, tblResponses.nonHouseholdOccupants, tblResponses.males0to3, tblResponses.females0to3, tblResponses.males4to10, tblResponses.females4to10, tblResponses.males11to17, tblResponses.females11to17, tblResponses.males18to64, tblResponses.females18to64, tblResponses.males64older, tblResponses.females64older, qryResponseWithHouseholdTotals.householdCount, tblResponses.attendingSchoolInBrent, tblResponses.attendingSchholOutOfBrent, tblResponses.numberOfEmployedPeople, tblResponses.numberOfBrentEmployedPeople, tblResponses.numberOfVehicles, tblResponses.[weekdayVehicleUsage?], tblResponses.[weeknightVehicleUsage?], tblResponses.[weekendVehicleUsage?], tblResponses.numberOfParkingSpots, tblResponses.[collectedByHand?] FROM tblAddresses INNER JOIN ((enuTenure RIGHT JOIN (enuPercent RIGHT JOIN (enuOwnershipType RIGHT JOIN (enuIncome RIGHT JOIN (enuHomeType RIGHT JOIN (enuGarden	This combines all data for each survey result, including the address. All enumerator fields are presented in the readable “name” form. This was used to export to the GIS maps.

	RIGHT JOIN tblResponses ON enuGarden.gardenID = tblResponses.gardenType) ON enuHomeType.homeTypeID = tblResponses.homeType) ON enuIncome.incomeID = tblResponses.householdIncome) ON enuOwnershipType.ownershipTypeID = tblResponses.ownershipType) ON enuPercent.percentID = tblResponses.incomeSpentOnMortgage) ON enuTenure.tenureID = tblResponses.occupancyTenure) LEFT JOIN qryResponseWithHouseholdTotals ON tblResponses.responseID = qryResponseWithHouseholdTotals.responseID) ON tblAddresses.ID = tblResponses.addressID;	
qry Home Type Generalization	SELECT tblResponses.homeType, Count(nz(tblResponses.homeType)) AS CountOfhomeType FROM tblResponses GROUP BY tblResponses.homeType;	This counts the number of responses from each type of home, including no-response.
qry Household Data By Borough Reference	SELECT tblAddresses.[Borough Reference], Avg(qryResponseWithHouseholdTotals.householdCount) AS AvgOfhouseholdCount, Avg(qryResponseWithHouseholdTotals.childrenCount) AS AvgOfchildrenCount, First(tblAddresses.Address) AS FirstOfAddress, First(tblAddresses.[corrected address]) AS [FirstOfcorrected address] FROM tblAddresses INNER JOIN (tblResponses INNER JOIN qryResponseWithHouseholdTotals ON tblResponses.responseID = qryResponseWithHouseholdTotals.responseID) ON tblAddresses.ID = tblResponses.addressID WHERE (((qryResponseWithHouseholdTotals.householdCount)>0)) GROUP BY tblAddresses.[Borough Reference];	Household averages by Borough Reference (development). Also provides one address from the development. This was used to map things in GIS.
qry Household Data By Local And Ownership	SELECT enuResidenceType.[local?], [qryHouseholdDataByResidenceZones-prequery].FirstOfownershipType, Count(tblResponses.responseID) AS CountOfresponseID1, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfhouseholdCount) AS AvgOfAvgOfhouseholdCount, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfchildrenCount) AS AvgOfAvgOfchildrenCount, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfbedroomCount) AS AvgOfAvgOfbedroomCount, Avg([qryHouseholdDataByResidenceZones-	Presents household data broken up by "local" responses (those who have not immigrated into UK in the last 5 years) and by ownership type.

	prequery].AvgOfnumberOfVehicles) AS AvgOfAvgOfnumberOfVehicles FROM ([qryHouseholdDataByResidenceZones-prequery] INNER JOIN tblResponses ON [qryHouseholdDataByResidenceZones-prequery].responseID = tblResponses.responseID) INNER JOIN ((enuResidenceType INNER JOIN enuResidences ON enuResidenceType.residenceTypeID = enuResidences.residenceType) INNER JOIN tblPreviousResidence ON enuResidences.residenceID = tblPreviousResidence.previousResidence) ON tblResponses.responseID = tblPreviousResidence.responseID GROUP BY enuResidenceType.[local?], [qryHouseholdDataByResidenceZones-prequery].FirstOfownershipType;	
qry Household Data By Ownership	SELECT enuOwnershipType.ownershipTypeName, Avg(qryResponseWithHouseholdTotals.householdCount) AS AvgHouseholdSizet, Avg(qryResponseWithHouseholdTotals.childrenCount) AS AvgNumOfChildren, Count(tblResponses.responseID) AS ResponseCount FROM enuOwnershipType INNER JOIN (qryResponseWithHouseholdTotals INNER JOIN tblResponses ON qryResponseWithHouseholdTotals.responseID=tblResponses.responseID) ON enuOwnershipType.ownershipTypeID=tblResponses.ownershipType WHERE (((qryResponseWithHouseholdTotals.householdCount)>0)) GROUP BY enuOwnershipType.ownershipTypeName;	This summarizes the average household size and average number of children by home ownership type. It also shows the number of responses involved in each calculation. Those who did not respond to the home ownership (Part 1, Q1) or household size (Part 2, Q1) are not included.
qry Household Data By Residence Zones - prequery	SELECT tblPreviousResidence.responseID, enuResidenceType.residenceTypeName, Count(qryResponseWithHouseholdTotals.responseID) AS CountOfresponseID, Avg(qryResponseWithHouseholdTotals.householdCount) AS AvgOfhouseholdCount, Avg(qryResponseWithHouseholdTotals.childrenCount) AS AvgOfchildrenCount, Avg(qryResponseWithHouseholdTotals.bedroomCount) AS AvgOfbedroomCount, Avg(qryResponseWithHouseholdTotals.livingAreaCount) AS AvgOflivingAreaCount, Avg(qryResponseWithHouseholdTotals.attendingSchoolInBrent) AS AvgOfattendingSchoolInBrent, Avg(qryResponseWithHouseholdTotals.attendingSchholOutOfBrent) AS AvgOfattendingSchholOutOfBrent, Avg(qryResponseWithHouseholdTotals.numberOfEmployedPeople) AS AvgOfnumberOfEmployedPeople, Avg(qryResponseWithHouseholdTotals.num	In order to count households of recent immigrants properly, it was necessary to restructure the way responses were counted. To do this, each response to the previous residence question was considered individually. Those results are grouped by survey response, then by area of origin. By doing this, we are able to count households that "have a member who came from a certain area" without over-counting households. For example, if we were to create averages based on the number of responses to the place of origin

	berOfBrentEmployedPeople) AS AvgOfnumberOfBrentEmployedPeople, Avg(qryResponseWithHouseholdTotals.numberOfVehicles) AS AvgOfnumberOfVehicles, First(enuTenure.TenureName) AS FirstOfTenureName, First(qryResponseWithHouseholdTotals.householdIncome) AS FirstOfhouseholdIncome, First(qryResponseWithHouseholdTotals.incomeSpentOnMortgage) AS FirstOfincomeSpentOnMortgage, First(qryResponseWithHouseholdTotals.ownershipType) AS FirstOfownershipType FROM (enuTenure INNER JOIN (qryResponseWithHouseholdTotals INNER JOIN tblResponses ON qryResponseWithHouseholdTotals.responseID = tblResponses.responseID) ON enuTenure.tenureID = tblResponses.occupancyTenure) INNER JOIN ((enuResidenceType INNER JOIN enuResidences ON enuResidenceType.residenceTypeID = enuResidences.residenceType) INNER JOIN tblPreviousResidence ON enuResidences.residenceID = tblPreviousResidence.previousResidence) ON tblResponses.responseID = tblPreviousResidence.responseID GROUP BY tblPreviousResidence.responseID, enuResidenceType.residenceTypeName;	question, larger households would be counted significantly more, resulting in skewed data. This approach will only count the household size once to each previous residence area indicated on the returned questionnaire. Even though the household size may be counted toward more than one average, the averages for each area are calculated correctly.
qry Household Data By Residence Zones	SELECT [qryHouseholdDataByResidenceZones-prequery].residenceTypeName, Count([qryHouseholdDataByResidenceZones-prequery].responseID) AS CountOfresponseID1, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfhouseholdCount) AS AvgOfAvgOfhouseholdCount, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfchildrenCount) AS AvgOfAvgOfchildrenCount, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfbedroomCount) AS AvgOfAvgOfbedroomCount, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOflivingAreaCount) AS AvgOfAvgOflivingAreaCount, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfattendingSchoolInBrent) AS AvgOfAvgOfattendingSchoolInBrent, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfattendingSchholOutOfBrent) AS AvgOfAvgOfattendingSchholOutOfBrent, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfnumberOfEmployedPeople) AS AvgOfAvgOfnumberOfEmployedPeople, Avg([qryHouseholdDataByResidenceZones-prequery].AvgOfnumberOfBrentEmployedPeople) AS AvgOfAvgOfnumberOfBrentEmployedPeople, Avg([qryHouseholdDataByResidenceZones-	This carries out the averages mentioned above to provide a summary of household data broken down by areas of previous residence.

	prequery].AvgOfnumberOfVehicles) AS AvgOfAvgOfnumberOfVehicles, Sum(IIf(([qryHouseholdDataByResidenceZones-prequery].FirstOfTenureName)="<1yr",1,0)) AS CountOfResidentForLess1yr, Sum(IIf(([qryHouseholdDataByResidenceZones-prequery].FirstOfTenureName)="1-3yr",1,0)) AS CountOfResidentFor1to3yr, Sum(IIf(([qryHouseholdDataByResidenceZones-prequery].FirstOfTenureName)="3yr+",1,0)) AS CountOfResidentForMore3yr, Sum(IIf(([qryHouseholdDataByResidenceZones-prequery].FirstOfIncomeSpentOnMortgage)="Less25",1,0)) AS CountOfLess25SpentOnMortgage, Sum(IIf(([qryHouseholdDataByResidenceZones-prequery].FirstOfIncomeSpentOnMortgage)="25To50",1,0)) AS CountOf25to50SpentOnMortgage, Sum(IIf(([qryHouseholdDataByResidenceZones-prequery].FirstOfIncomeSpentOnMortgage)="50To75",1,0)) AS CountOf50to75SpentOnMortgage, Sum(IIf(([qryHouseholdDataByResidenceZones-prequery].FirstOfIncomeSpentOnMortgage)="More75",1,0)) AS CountOfMore75SpentOnMortgage, Sum(IIf([qryHouseholdDataByResidenceZones-prequery].FirstOfhouseholdIncome="Less10",1,0)) AS CountOfMakingLess10k, Sum(IIf([qryHouseholdDataByResidenceZones-prequery].FirstOfhouseholdIncome="10To35",1,0)) AS CountOfMaking10to35k, Sum(IIf([qryHouseholdDataByResidenceZones-prequery].FirstOfhouseholdIncome="35To50",1,0)) AS CountOfMaking35to50k, Sum(IIf([qryHouseholdDataByResidenceZones-prequery].FirstOfhouseholdIncome="50To75",1,0)) AS CountOfMaking50to75k, Sum(IIf([qryHouseholdDataByResidenceZones-prequery].FirstOfhouseholdIncome="More75",1,0)) AS CountOfMakingMore75k FROM [qryHouseholdDataByResidenceZones-prequery] GROUP BY [qryHouseholdDataByResidenceZones-prequery].residenceTypeName;	
qry Household Size By Room Count	SELECT (qryResponseWithHouseholdTotals.bedroomCount+qryResponseWithHouseholdTotals.livingAreaCount) AS roomCount, qryResponseWithHouseholdTotals.householdCount, qryResponseWithHouseholdTotals.childre	This calculates the total rooms and total household size for all responses that answered both questions (Part 1, Q4 and Part 2, Q1)

	nCount, qryResponseWithHouseholdTotals.responseID, qryResponseWithHouseholdTotals.addressID, qryResponseWithHouseholdTotals.bedroomCount, qryResponseWithHouseholdTotals.livingAreaCount, qryResponseWithHouseholdTotals.occupancyTenure FROM qryResponseWithHouseholdTotals WHERE (((qryResponseWithHouseholdTotals.householdCount)>0) AND (([qryResponseWithHouseholdTotals].[bedroomCount]+[qryResponseWithHouseholdTotals].[livingAreaCount])>0));	
qry Household Size By Tenure	SELECT enuTenure.TenureName AS Expr1, Avg(qryResponseWithHouseholdTotals.householdCount) AS AvgOfhouseholdCount, Count(qryResponseWithHouseholdTotals.responseID) AS responseCount FROM [SELECT * FROM qryResponseWithHouseholdTotals INNER JOIN (enuTenure INNER JOIN tblResponses ON enuTenure.tenureID = tblResponses.occupancyTenure) ON qryResponseWithHouseholdTotals.responseID = tblResponses.responseID WHERE qryResponseWithHouseholdTotals.householdCount > 0]. AS [%$##@_Alias] GROUP BY enuTenure.TenureName;	Average household size of each of the length of residence options (from Part 1, Q3)
qry Non Respondants To Origin	SELECT tblResponses.responseID, tblResponses.addressID, tblResponses.homeType, tblResponses.ownershipType, tblResponses.occupancyTenure, tblResponses.bedroomCount, tblResponses.livingAreaCount, tblResponses.gardenType, tblResponses.[bigBalcony?], tblResponses.[patio?], tblResponses.[privateRoofTerrace?], tblResponses.[communalRoofTerrace?], tblResponses.satisfactionNumRooms, tblResponses.satisfactionRoomSize, tblResponses.satisfactionAmenitySpace, tblResponses.satisfactionParkingSize, tblResponses.satisfactionNotes, tblResponses.householdIncome, tblResponses.incomeSpentOnMortgage, tblResponses.nonHouseholdOccupants, tblResponses.males0to3, tblResponses.females0to3, tblResponses.males4to10, tblResponses.females4to10, tblResponses.males11to17, tblResponses.females11to17, tblResponses.males18to64, tblResponses.females18to64, tblResponses.males64older,	Gives data about the non-respondents to Part 2, Q4 about previous living area.

	tblResponses.females64older, tblResponses.attendingSchoolInBrent, tblResponses.attendingSchholOutOfBrent, tblResponses.numberOfEmployedPeople, tblResponses.numberOfBrentEmployedPeople, tblResponses.numberOfVehicles, tblResponses.[weekdayVehicleUsage?], tblResponses.[weeknightVehicleUsage?], tblResponses.[weekendVehicleUsage?], tblResponses.numberOfParkingSpots, tblResponses.[collectedByHand?], tblResponses.name, tblResponses.phone, tblResponses.entryTime FROM tblResponses LEFT JOIN tblPreviousResidence ON tblResponses.responseID = tblPreviousResidence.responseID WHERE (((tblPreviousResidence.responseID) Is Null));	
qry Non Respondents To Transportation	SELECT tblResponses.responseID, tblResponses.addressID, tblResponses.homeType, tblResponses.ownershipType, tblResponses.occupancyTenure, tblResponses.bedroomCount, tblResponses.livingAreaCount, tblResponses.gardenType, tblResponses.[bigBalcony?], tblResponses.[patio?], tblResponses.[privateRoofTerrace?], tblResponses.[communalRoofTerrace?], tblResponses.satisfactionNumRooms, tblResponses.satisfactionRoomSize, tblResponses.satisfactionAmenitySpace, tblResponses.satisfactionParkingSize, tblResponses.satisfactionNotes, tblResponses.householdIncome, tblResponses.incomeSpentOnMortgage, tblResponses.nonHouseholdOccupants, tblResponses.males0to3, tblResponses.females0to3, tblResponses.males4to10, tblResponses.females4to10, tblResponses.males11to17, tblResponses.females11to17, tblResponses.males18to64, tblResponses.females18to64, tblResponses.males64older, tblResponses.females64older, tblResponses.attendingSchoolInBrent, tblResponses.attendingSchholOutOfBrent, tblResponses.numberOfEmployedPeople, tblResponses.numberOfBrentEmployedPeople, tblResponses.numberOfVehicles, tblResponses.[weekdayVehicleUsage?], tblResponses.[weeknightVehicleUsage?], tblResponses.[weekendVehicleUsage?], tblResponses.numberOfParkingSpots, tblResponses.[collectedByHand?], tblResponses.name, tblResponses.phone, tblResponses.entryTime FROM tblResponses LEFT JOIN tblWorkerTransportation ON tblResponses.responseID=tblWorkerTrans	Gives data about non respondents to Part 2, Q7 about worker transportation. Note that there must be people listed as working for empty boxes to be considered non-repsonse.

	portation.responseID WHERE (((tblResponses.numberOfEmployedPeople)>0) AND ((tblWorkerTransportation.responseID) Is Null));	
qry Previous Living Area Counts	SELECT tblResponses.responseID, Count(tblPreviousResidence.previousResidenceID) AS CountOfpreviousResidenceID FROM (qryResponseWithHouseholdTotals INNER JOIN tblResponses ON qryResponseWithHouseholdTotals.responseID = tblResponses.responseID) INNER JOIN ((enuResidenceType INNER JOIN enuResidences ON enuResidenceType.residenceTypeID = enuResidences.residenceType) INNER JOIN tblPreviousResidence ON enuResidences.residenceID = tblPreviousResidence.previousResidence) ON tblResponses.responseID = tblPreviousResidence.responseID GROUP BY tblResponses.responseID;	Gives a count of the number of responses to the previous living area question (Part 2, Q4) on each response.
qry Prob Household Count NE Living Area Responses	SELECT qryResponseWithHouseholdTotals.responseID, qryPreviousLivingAreaCounts.CountOfpreviousResidenceID, qryResponseWithHouseholdTotals.householdCount FROM qryPreviousLivingAreaCounts INNER JOIN qryResponseWithHouseholdTotals ON qryPreviousLivingAreaCounts.responseID=qryResponseWithHouseholdTotals.responseID WHERE qryPreviousLivingAreaCounts.CountOfpreviousResidenceID<>qryResponseWithHouseholdTotals.householdCount;	Detects responses where the household size (sum of Part 2, Q1) does not equal the number of responses in the previous living area question (Part 2, Q4).
qry Prob Too Many Children	SELECT qryResponseWithHouseholdTotals.responseID, qryResponseWithHouseholdTotals.addressID, qryResponseWithHouseholdTotals.householdCount, qryResponseWithHouseholdTotals.childrenCount FROM qryResponseWithHouseholdTotals WHERE ((childrenCount=householdCount) And (householdCount>0));	Detects responses where the only people listed in the home were reported to be children.
qry Response Proportions	SELECT enuOwnershipType.ownershipTypeName, Count(tblResponses.responseID) AS	Calculates the number and proportion of responses to each ownership type.

Ownership	responseCount, Count(tblResponses.responseID)/(SELECT count(*) FROM tblResponses WHERE ownershipType Is Not Null) AS proportion FROM enuOwnershipType INNER JOIN tblResponses ON enuOwnershipType.ownershipTypeID = tblResponses.ownershipType GROUP BY enuOwnershipType.ownershipTypeName;	
qry Responses Per Date	SELECT Format(tblResponses.entryTime, "mm/dd") AS entryDate, Count(tblResponses.responseID) AS CountOfresponseID FROM tblResponses GROUP BY Format(tblResponses.entryTime, "mm/dd");	Shows the number of responses received each day
qry Response With Household Totals	SELECT (males0to3+females0to3+males4to10+females4to10+males11to17+females11to17+males18to64+females18to64+males64older+females64older) AS householdCount, (males0to3+females0to3+males4to10+females4to10+males11to17+females11to17) AS childrenCount, * FROM tblResponses;	Calculates the household size and number of children for each response.
qry Shared Housing Only	SELECT tblResponses.nonHouseholdOccupants, qryResponseWithHouseholdTotals.householdCount, qryResponseWithHouseholdTotals.childrenCount, enuOwnershipType.ownershipTypeName, enuHomeType.homeTypeName FROM enuHomeType INNER JOIN (enuOwnershipType INNER JOIN (qryResponseWithHouseholdTotals INNER JOIN tblResponses ON qryResponseWithHouseholdTotals.responseID = tblResponses.responseID) ON enuOwnershipType.ownershipTypeID = tblResponses.ownershipType) ON enuHomeType.homeTypeID = tblResponses.homeType WHERE (((tblResponses.nonHouseholdOccupants)>0));	Provides data about shared housing responses
qry Totals For Each Area	SELECT Count(tblResponses.responseID) AS CountOfresponseID, enuResidenceType.residenceTypeName FROM ((tblAddresses INNER JOIN tblResponses ON tblAddresses.ID = tblResponses.addressID) INNER JOIN (enuResidenceType INNER JOIN (enuResidences INNER JOIN tblPreviousResidence ON enuResidences.residenceID =	Gives a count of the number of responses from each “immigration area” as defined in the enuResidenceType table.

	tblPreviousResidence.previousResidence) ON enuResidenceType.residenceTypeID = enuResidences.residenceType) ON tblResponses.responseID = tblPreviousResidence.responseID) INNER JOIN tblWorkerTransportation ON tblResponses.responseID = tblWorkerTransportation.responseID GROUP BY enuResidenceType.residenceTypeName;	
qry Totals For Each Place	SELECT Count(tblResponses.responseID) AS CountOfresponseID, enuResidences.residenceName, enuResidences.residenceType FROM ((tblAddresses INNER JOIN tblResponses ON tblAddresses.ID = tblResponses.addressID) INNER JOIN (enuResidences INNER JOIN tblPreviousResidence ON enuResidences.residenceID = tblPreviousResidence.previousResidence) ON tblResponses.responseID = tblPreviousResidence.responseID) INNER JOIN tblWorkerTransportation ON tblResponses.responseID = tblWorkerTransportation.responseID GROUP BY enuResidences.residenceName, enuResidences.residenceType;	Gives a count of the number of responses from each "immigration previous residence" as defined in the enuResidences table.

XIV.3.3 Forms and Application

In order to facilitate quick and easy data entry and analysis, application features were developed using Access forms. Features include the ability to navigate the menu system, enter new survey results, enter new previous residence choices, enter new previous residence zones, and remap residence choices. The survey entry form is supported by two sub-forms, one to allow the entry of any number of responses to the question on previous residence, and another to allow any number of responses to the worker transportation question.

Table 18 gives detailed descriptions of the design of each form.

Table 18: List of Forms in the Database Application

Form Name	Form Purpose	Form Design Notes
frm Response Entry	Allows entry and viewing of survey responses	Contains fields that correspond directly to the questions on the questionnaire. Also contains a field to record the unique ID of the questionnaire and a checkbox to denote whether the survey was collected in-person. Designed for fast entry of data by making the fields match the order of the questionnaire and having options in drop down boxes which can be selected by typing several letters. Contains two sub-forms for entering multiple responses (or no responses) to the previous residence question and the worker transportation question.
frm Previous Residence Subform	Provides a datasheet view of previous residence responses	Used in the frm Response Entry to allow any number of responses to the previous residence question. By connecting the responseID fields in tblResponses with the responseID field in tblPreviousResidences, only the responses returned on a given questionnaire are used. One annoying point to this form is the need to run Requery() on the dropdown box every time it is clicked to be sure that recently added residence choices are made available. This is done via the on-click event, in a VB procedure.
frm Worker Transportation	This is exactly the same as frm Previous Residence Subform,	Also same, except there are not dropdowns, only check

Subform	except used on the worker transportation table.	boxes, which do not require Requery().
frm Residence Entry	Allows entry and viewing of options for selection as answers to the previous residence question.	One text box for entering the name of the new option and one dropdown for selecting the zone that option counts towards. There's also a button to open up the frm Residence Type Entry, allowing the addition of new zones.
frm Residence Type Entry	Allows entry and viewing of options for selection as residence zones	One text box for entering the name of the new zone.
frm Survey Search	Allows the user to search for a survey by address ID number or response ID number.	A text box and a button to search by address ID and the same to search by response ID. Conducting the search opens frm Residence Entry, filtered to only the result selected. There is no protection against searching for results that don't exist – in this case, an empty result is opened.
frm Residence Remap	Allows the user to "remap" residences listed in the "Other" category to residences listed in any other category. The basic procedure is this: For all residence responses using the residence to be remapped, change them to the new value. Delete the old value from the list of options	Two dropdown boxes – one for picking the old residence, one for picking the new one. One button to execute the command. The execution is handled in the button's "on-click" event. It runs 2 SQL commands – one to update all the responses with the new residence, one to delete the old residence as an option. A warning box is displayed by Access on both actions.
Switchboard	Allows the user to navigate the menu system	Generated by Access. See Tools → Database Utilities → Switchboard Manager

XIV.3.4 Reports

Eight reports allow the user safe access to the data in an easy to read, properly formatted manner. Most were generated by Access's wizard, then the titles of fields were edited to make sense to humans. The only exception to this is rptResponseSummary, which was created from scratch in order to calculate the response rate of the survey and the non-response to each question. The math in this report is carried out in the text fields, and uses functions defined in the ResponseEvaluations module.

The other reports were not used directly in the analysis of data, and are self explanatory. They will not be detailed in this section. Instead, refer to the queries, which provided all the raw data to run analysis and generate the reports.

XIV.3.5 Macros

The macros defined in this application are very simple. They are each used to open a different query in a certain view. This functionality was used in the Switchboard, which does not natively support opening queries, but does support running macros.

XIV.3.6 Modules

There is only one module, "ResponseEvaluations", defined in this application. It supplies functions that count things in the database such as: total number of responses, total number of good addresses, total number of bad addresses, and non-responses to each question. Each function relies on the DCount() method to run a count query on different tables. The

functionality provided by this module is trivial, so it will not be detailed any further.

XV Appendix H: Inference Calculations

Has Overcrowding Increased Since 2001?

$H_0: p = 0.0499$

$H_a: p > 0.0499$

$y^* = 191$

$n = 708$

$$z^* = \frac{191 - 798 * .0499 - 0.5}{\sqrt{708(.0499)(1 - .0499)}} = 26.01$$

$P(Z > 26.01) \cong 0$

Yes, extremely confident

Do Recent Migrants Have Larger Household Sizes?

$\mu_1 \equiv local\ mean$

$\mu_1 \equiv migrant\ \ mean$

$H_o: \mu_1 = \mu_2$

$H_a: \mu_1 < \mu_2$

$\mu_1 = 2.55$

$s_1 = 1.53$

$n_1 = 612$

$\mu_2 = 3.04$

$s_2 = 1.77$

$n_2 = 46$

$$s_p^2 = \frac{(612-1) * 2.55^2 + (46-1) * 3.04^2}{612 + 46 - 2} = 7.78$$

$$\sigma(\overline{y_1} - \overline{y_2}) = \sqrt{7.78(\frac{1}{612} + \frac{1}{46}} = 0.426$$

$$t^{(p)*} = \frac{2.55 - 3.04}{0.426} = -1.15$$

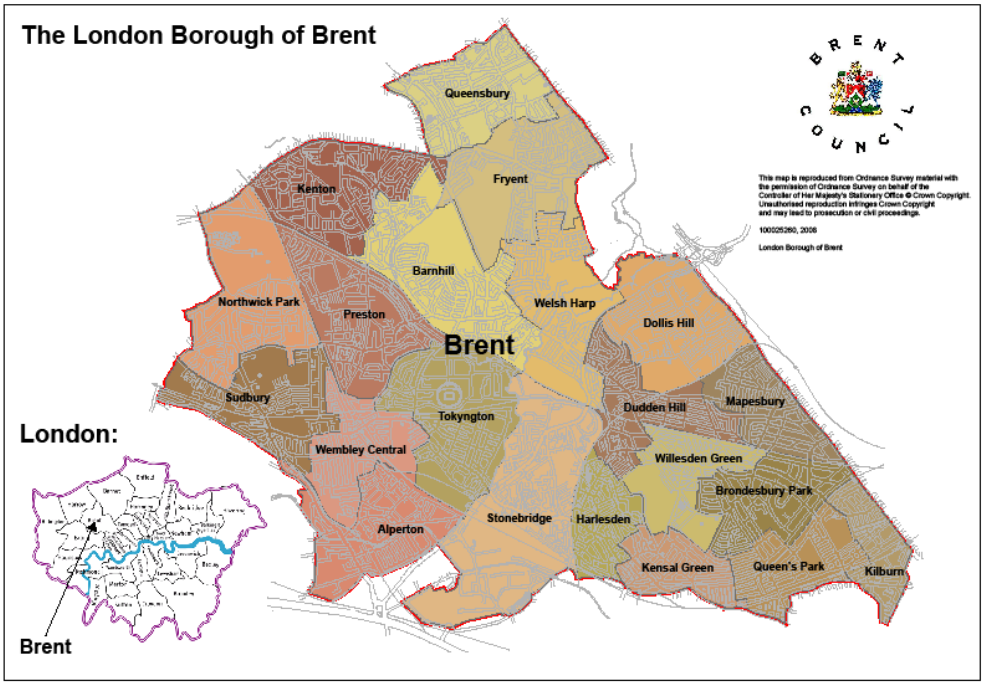
$P(t \leq -1.15) = 0.87$

Yes, 87% Confidence

XVI Appendix I: GIS Analysis

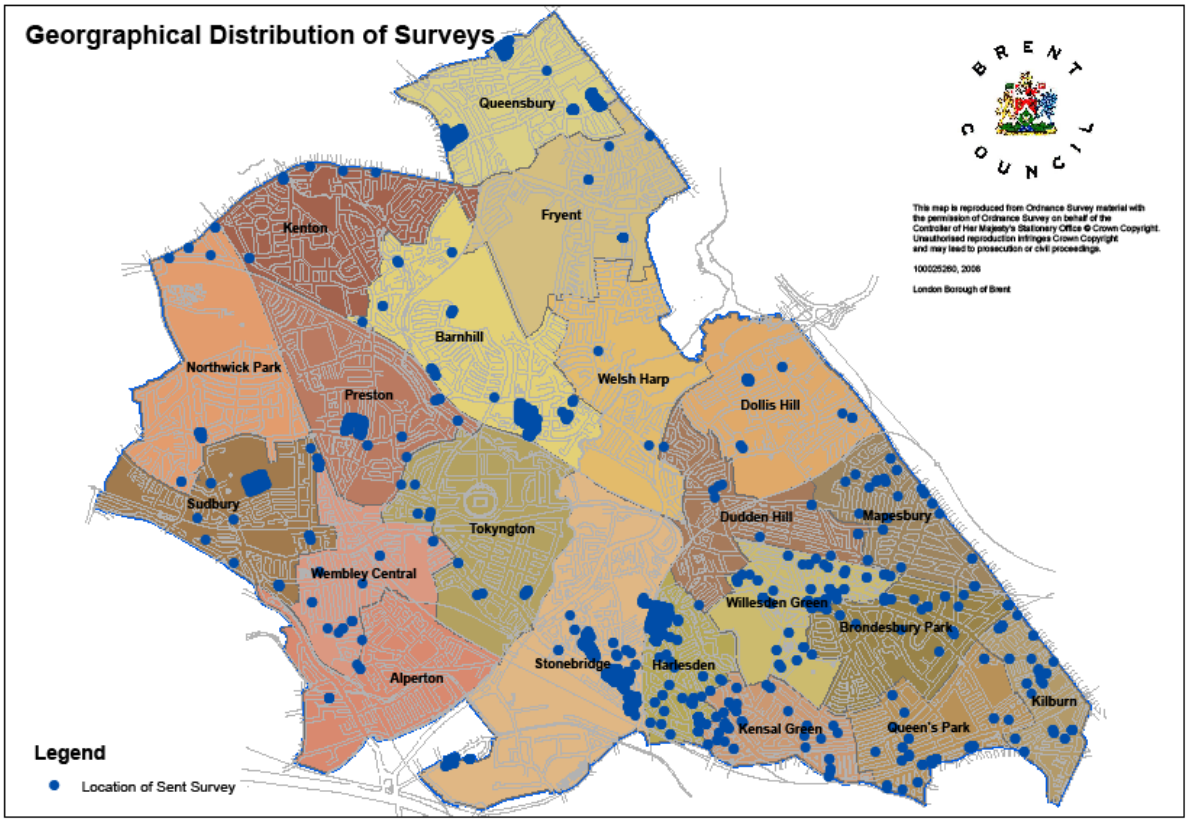
Our data were analyzed geographically using ARCMap software provided to us by the Planning Service GIS team. Below are the maps we were able to create and a brief description of each map showing the trends we were able to see. Unfortunately, due to time constraints, we were unable to find any significant trends on some of the maps we created and therefore some data has not been analyzed to its full potential. However, we feel that our database contains a significant amount of data that has yet to be analyzed using GIS capabilities. Some maps contain suggestions on how we feel the data could be better represented.

Map 1: A map of the Borough



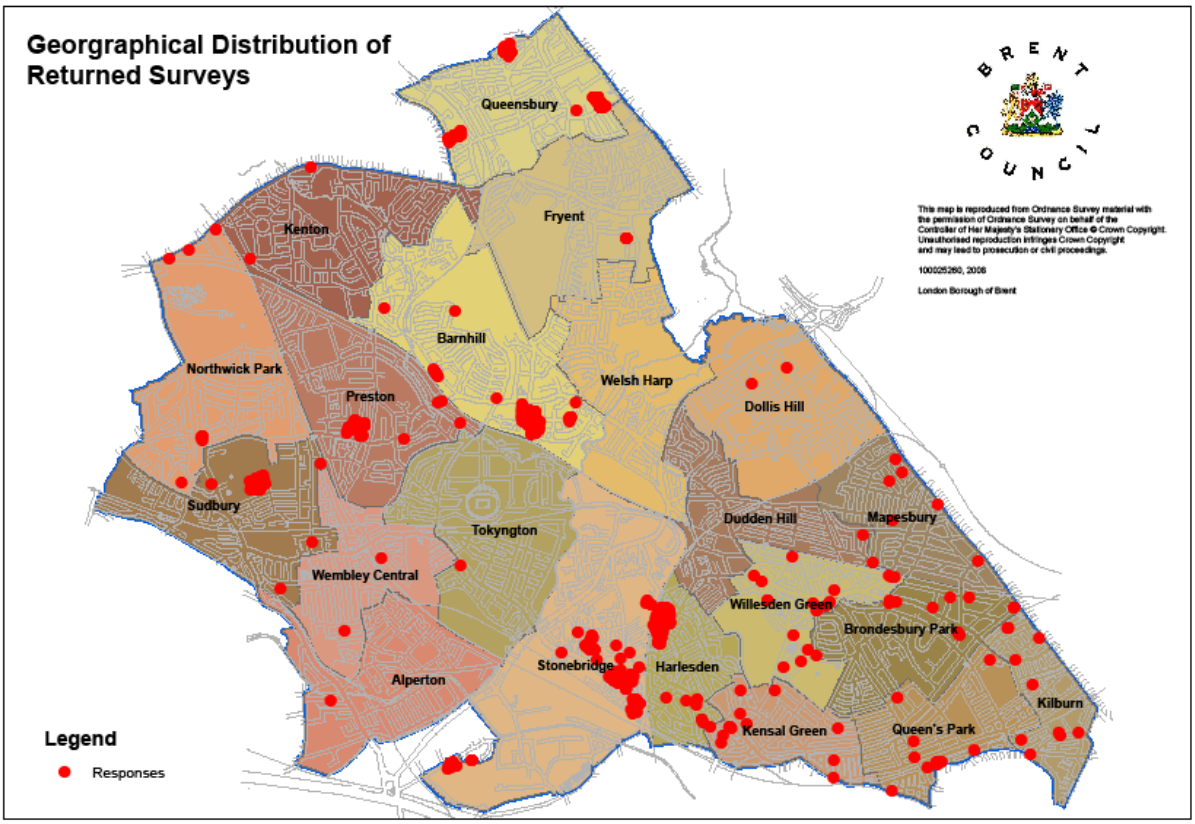
The above map shows the Borough and its individual wards. It also shows where Brent is located within London in the smaller map on the bottom left.

Map 2: A map showing where we sent our questionnaires



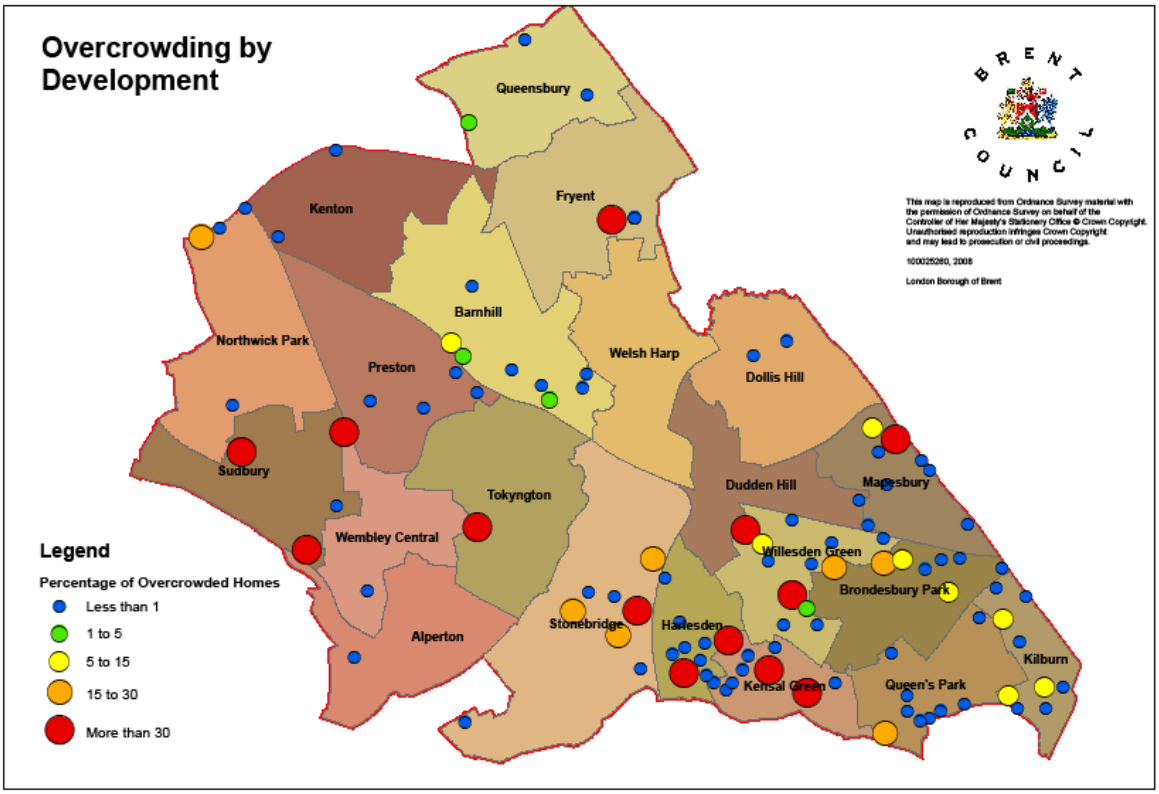
This map allowed us to see where each individual questionnaire was delivered to. If a questionnaire was sent to an address in Brent, it was marked by a blue circle on this map. This allowed us to get a good idea of where the new homes were in Brent and allowed us to see if the responses we received represented a broad range of the newer homes in Brent. The Southeast of Brent contained the largest number of new homes to be surveyed.

Map 3: A map showing the responses we received



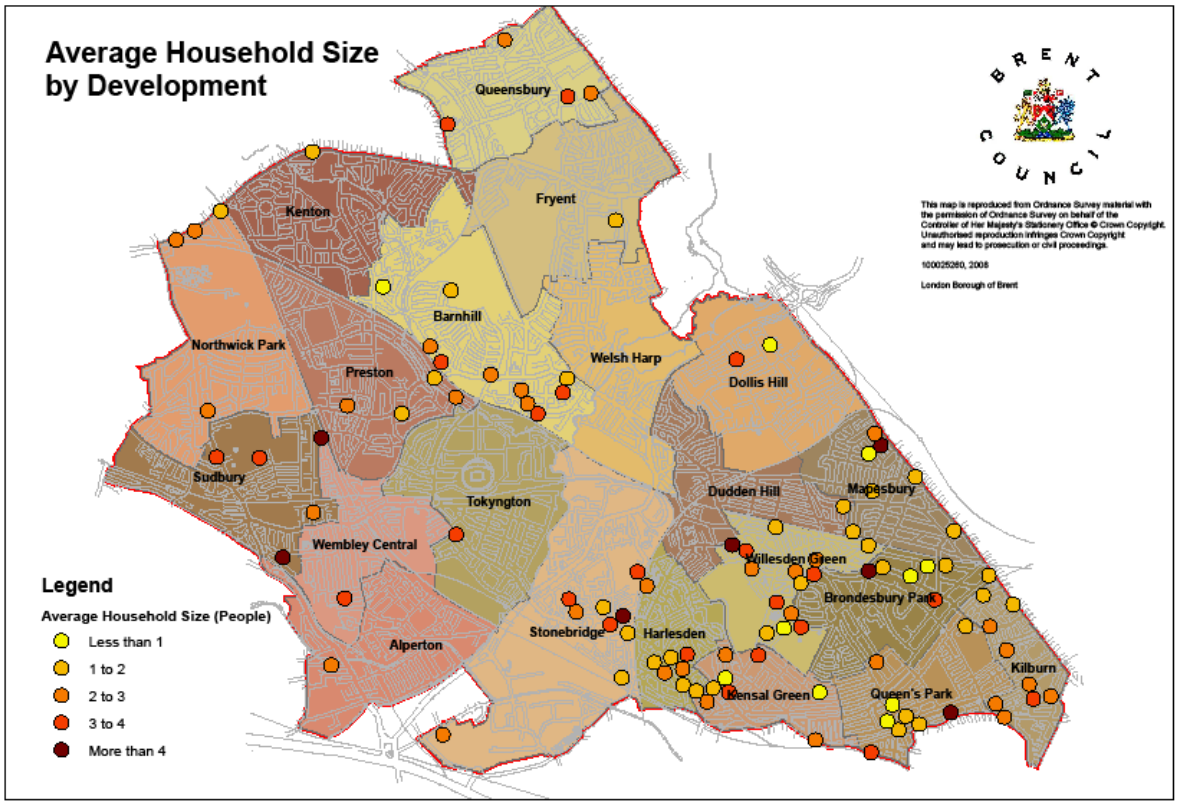
This map allowed us to see which homes in the Borough were sending their questionnaires back. It also allowed us to compare visually to the map of sent surveys, Map 2 above, and see if our responses were giving a true representation of the sample of new homes. As evidenced by the two maps, one can see that while we received 17.3% of the sent questionnaires, there seemed to be a generally broad distribution of responses. This helped us to substantiate our claims that the trends we were finding in our data represented all the new homes in Brent and not just a few developments or homes from a certain ward. It should be noted again that there were a large number of homes in the Southeast of Brent.

Map 4: Overcrowded Homes



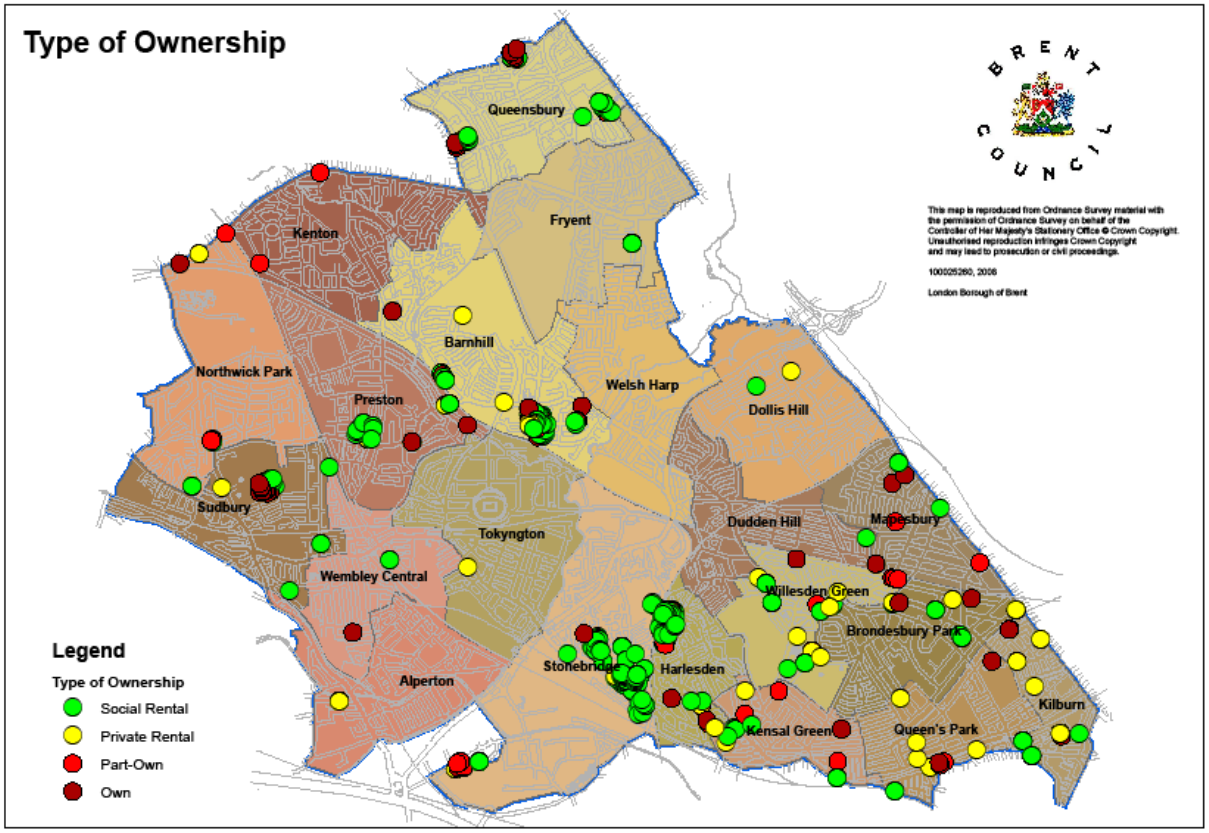
This map shows the percentage of homes in a development that were overcrowded. The map backs up our claim that 27% of new homes were overcrowded; most markers on the map fall into the two ranges of 15 to 30% or more than 30%. This also allowed us to see that overcrowding seems to be prevalent across the entire Borough, not just in certain areas. However, it can also be seen that developments in the wards of Stonebridge, Kensal Green, Harlesden and Willesden Green tended to be more overcrowded.

Map 5: The average household sizes of new developments in Brent



This map shows the average household size of developments across the Borough. This map shows a good overview of the number of new developments in the Borough but unfortunately did not show any significant trends in the average household size of developments. However, further analysis into this data may yield a much better visual representation of this data. One suggestion on how to better represent this data would be to take the Borough-wide 2001 Census data and attempt to shade the map different colors based on the average household size of a region. This would enable planning officials to better see if there are areas where homes tend to be larger or smaller than the average household size of the Borough.

Map 6: Ownership Type



This map shows the different types of ownership of the surveyed homes in the Borough. As can be seen, most homes surveyed were of the ownership type social rental. It can also be seen from this map that social rentals seem to be very prevalent in the wards of Harlesden and Stonebridge. Furthermore, it can be seen that the majority of the homes surveyed are being rented either privately or through housing associations. As with Map 5, it would be very useful if Borough-wide data was used to map all homes in the Borough based on their type of ownership so that planners could easily tell what type of homes need to be built in certain regions.

XVII Appendix J: Calculation File

Please see the attached Excel file, Survey_Responses.xls, which contains all of the raw data used to generate our findings. Also the tables presented in our report, as other analyses are available in this file.