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THE SPATIAL DYNAMICS OF BRITAIN'S ETHNIC COMMUNITIES ESTIMATING THE CHANGING ETHNIC GEOGRAPHY OF LONDON 1981-91

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Abstract

This working paper presents the concepts, methodology and results from a project seeking to produce population estimates for the different ethnic groups of London's Boroughs for the year 1981. Ethnicity is explained as a conceptual framework, methodology and results are described, and an analysis of change over the period 1981 to 1991 is undertaken. Estimates are produced using three different methodologies and various data sources: the 1991 Census Local Base Statistics, the 1991 Individual Sample of Anonymised Records, and the 1981 Longitudinal Study. It is concluded that a combination of data sets and methodologies will provide more satisfactory results. The analysis of results generated by the estimation routines will inform a second stage of estimation routines, which will build on the first.

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1 INTRODUCTION

The 1991 Census of Population was the first time a direct self-assessment question on ethnic group membership was posed and as such is a landmark in understanding the ethnic geography of Great Britain. Prior censuses had used the proxy measure of country of birth of a person (from 1841), the country of birth of parents (1971) or of the "head of household" (1981) to record ethnicity. However, using country of birth as an indicator of ethnicity becomes less satisfactory and more misleading as time passes and increasing numbers of ethnic minority group members are born in this country. Measuring spatial change over time in these groups has proved problematic as the very nature of change requires that data for at least two points in time exist. However, as has been previously stated, comparable ethnic population data did not exist in 1981.

Greater London is important in its role as a centre of ethnic minority population. In 1991, Britain's ethnic groups accounted for just over 5 per cent of the population. London was home to 44.6 per cent of these groups with 16 of its districts featuring in the first 20 places in the list of districts with the greatest proportions of ethnic minorities (Storkey and Lewis, 1996). Using London as the study's spatial framework provides an areal database containing sufficient data on these groups for successful analysis. This may not be the case if some of Great Britain's more rural counties were the focus of study. Ethnic minority groups are strongly represented in London, compared with Great Britain as a whole (Storkey and Lewis, 1996). However, it is important not to overestimate the importance of London to these groups. In 1991, London was home to 77.1 per cent of Britain's Black-Africans, whereas only 18.4 per cent of Pakistanis resided there. Ethnic minority populations are concentrated in a core of medium and large sized cities stretching from London in the south-east to Lancashire in the north-west (Owen, 1994). This set of regions, namely the South East, East Midlands, West Midlands, Yorkshire and Humberside, and the North-West is home to 92 per cent of Britain's ethnic minority population (Rees and Phillips, 1996).

This project seeks to produce ethnic group population estimates for 1981 for the Boroughs of Greater London in order that spatial change over the intercensal period can be described. This will allow the patterns of ethnic group concentration to be detected, and the detailed dynamic geographies of each group to be compared and contrasted.

This working paper outlines the estimation work completed to date, and presents preliminary results. Section 1 provides a background to the work and explains the importance and requirements of estimating population change among ethnic groups. Section 2 shows that ethnicity is a complex concept and outlines the data implications that arise from this. The methodology used here and in other estimation work is described in Section 3, and the following Section 4 presents the results in an evaluative framework. A summary and conclusion are provided in Section 5, which also briefly outlines the direction for future work.

1.1 Why do we need ethnic group estimates?

The importance of providing counts of ethnic minority populations over a time series cannot be underestimated. Estimates of these dynamic populations are of great importance to policy analysts, certain pressure groups, community organisations and statutory bodies such as the Commission for Racial Equality. Without these data, there is no way of assessing the success or failure of existing policies and their impact on ethnic minority groups. For example, local

authorities and health authorities are under a legal obligation to consider the size of ethnic minority populations in the allocation of resources or in the formulation of policy concerning housing, employment, health and social security (Haskey, 1991). There is also the academic contribution of the estimates to research. The work will provide an understanding of the changing patterns of settlement in Greater London, raising questions about the processes which are taking place amongst the region's ethnic groups.

One census enumeration only provides a snapshot in time of the geographical distributions of populations that are undergoing continuous evolution (Rees and Phillips, 1996). The present ethnic geography of London needs to be understood in the context of what has gone before.

1.2 Requirements for estimating ethnic group population change

In order to provide an effective description of geographical change over time, two requirements must be fulfilled. Firstly, the areal unit must remain geographically constant over time. This is fulfilled when using the 33 local authority districts (boroughs) of Greater London as a base for the estimation process. Secondly, the two data sets must be comparable for any change over time to be calculated. As outlined above, this requirement is not met, as 1991 was the first time an ethnic group question was asked in the census. Detailed country of birth tables are available for 1981, but the relationship between numbers in these groups and ethnicity has changed greatly over time. More members of ethnic minority groups were born in Great Britain in 1991 than in 1981. A decreasing proportion of Whites born in New Commonwealth countries has also altered the relationship between country of birth and ethnicity. Various attempts have been made to cater for such changes in estimation procedures (Rees and Phillips, 1996 and Owen, 1996), which will be evaluated later in this paper.

However, before embarking upon a technical discussion of estimation models and their results it is necessary to fully understand the concept of ethnicity in the context of social geography. A comprehensive awareness of the issues that surround this notion allows a more meaningful interpretation of results produced by the models.

2 THE CONCEPT OF ETHNIC GROUP CLASSIFICATION AND DATA IMPLICATIONS

An ethnic group is a set of persons with a common "ethnos" (from the Greek word for nation). It therefore follows that ethnicity is the state of belonging to an ethnic group. A person's nation is usually something that they are ascribed at birth, and which stays with them for the remainder of their lives. Ethnicity contrasts with many other social characteristics which can change continuously over time (age, life stage), which can be entered and exited (married, divorced), which can be achieved or lost (income status, occupation).

But what is the nature of a person's "ethnos"? Can it change over time? Is it situational? Does it depend on self-identification or social ascription? What detailed and measurable attributes are used to operationalise "ethnos"?

The above questions illustrate that measuring ethnicity in any society is a challenge. The search for definitions of ethnicity has preoccupied scholars in various fields, especially sociology, psychology and anthropology (Pryor et al, 1992). The problems of "objective" versus "subjective" mean that there is no firm agreement on what criteria determine ethnicity.

Evaluations of official statistics in recent years highlight the fundamental measurement and classification problems. The variety of nomenclature used in describing ethnicity indicates the complexity of the concept. In the search for an ethnic group question for the British census of population, Sillitoe observed (1978, pp. 2-3):

"...the concepts are very imprecise and the ethnic distinctions of relevance in each country differ considerably."

Ethnicity is multi-dimensional. It is based on numerous grounds, including language, country of birth or residence, race and religion. The contexts for individual respondents shift over time and space, and the issue of multiple responses and changed responses becomes prevalent. Peach (1996, p.5) comments that:

"One may be Welsh in England, British in Germany, European in Thailand, White in Africa."

Thus ethnicity is contextual rather than absolute, and situational rather than an independent category.

It is also evident that ethnicity includes many aspects in common with "race" (Haskey, 1997). In some instances, ethnicity and race are used interchangeably. Bulmer (1996, p.36) states that ethnicity:

"...reflects the fact that members of both ethnic minority groups and the majority population perceive differences between groups in society and define the boundaries of such groups, taking into account a variety of characteristics including physical ones, such as skin colour."

Barth (1969) has argued that the nature of ethnicity consists of two kinds of basic transaction. Primarily, there are processes of internal definition which occur when actors signal a self-definition of their identity. This can be an individual or group process. Secondly, there is the process of external definition, in which one person or a set of persons ascribes group

membership to others. This is an imposition by one set of actors upon another of name and characterisation that affects in significant ways the social experience(s) of the categorised. Thus, the production, reproduction and transformation of the social boundaries of ethnic groups is a two way process, taking place between the boundary of "them" and "us".

It can therefore be seen that ethnicity is a complex concept with many underlying issues. This is elucidated by the long search for a "valid" Census ethnic group question. The 1991 census recorded ethnicity using the coding framework for responses to the ethnic group question shown in Table 1.

It is evident from this classification that the emphasis is on categorising the non-European groups, and amalgamating the European population into a single white group (Peach, 1996a) rather than measuring ethnicity. "White" is not an ethnic group, and similarly "Black" is grounded in the phenotype paradigm. Indian, Pakistani and Bangladeshi are reflections of geography or nationality. Chinese is a combination of groups with roots in China itself, Hong Kong, Singapore, Vietnam and Taiwan (Peach, 1996b). The two "other" categories contain by definition a wide variety of people with different histories, cultures and religions (Ratcliffe, 1996).

However, the 1991 Census classifications of ethnicity are widely used in ethnic group research, validated by the Census being the most robust, nationally comparable source of data available. If it is the case that material disadvantage applying to broadly defined groups was the main issue in including an ethnic group question in the 1991 Census, then it follows that the crude divisions of the population listed above will be an adequate measure of ethnicity in Britain (Ratcliffe, 1996). It is therefore seen as appropriate that these ethnic group categories are used in defining the populations in the estimation models.

Table 1: Ethnic group coding framework

10-fold classification	Full listing
White	White
	Irish
	Greek/Greek Cypriot
	Turkish/Turkish Cypriot
	Mixed White
Black-Caribbean	Black-Caribbean
	Caribbean Island
	West Indies
	Guyana
Black-African	Black-African
	Africa south of the Sahara
Black-Other	Black-Other
	Black-British
	Black-Mixed Black/White
	Black-Mixed Other
Indian	Indian
Pakistani	Pakistani
Bangladeshi	Bangladeshi
Chinese	Chinese
Other-Asian	East-African Asian
	Indo-Caribbean
	Black-Indian sub-continent
	Black-Other Asian
Other-Other	North Africa/Arab/Iranian
	Mixed Asian/White
	British ethnic minority (other)
	British (no indication)
	Other Mixed Black/White
	Other Mixed Asian/White
	Other Mixed-Other

Source: Owen, D. (1992) Appendix 2, in Ethnic minorities in Britain: Settlement Patterns. Statistical Paper No. 1. ESRC Centre for Research In Ethnic Relations, University of Warwick

3 METHODOLOGY

The methodological approach pioneered by Haskey (1991), Rees and Phillips (1996) and Owen (1996) in producing estimates of Britain's changing ethnic geography has been that of *conditional probability*. This method entails calculating the conditional probability of belonging to ethnic group *e* given country of birth *b* and district of residence *d*:

$p(e|b,d)$ where p is the conditional probability, e is the ethnic group, b is the country of birth, d is district of residence

For example, the 1991 Census Local Base Statistics (LBS) Table 51 reports that in the London Borough of Lambeth at the time of the 1991 Census, 17,201 of the 166,830 residents born in England were Black-Caribbean. Therefore, the conditional probability of being an English-born Black-Caribbean resident of Lambeth at the time of the 1991 Census is 0.1031 or 10.31%. This is calculated by:

$$p(e|b,d) = P_{eb}^{d}(91) / \sum_{e} P_{eb}^{d}(91)$$

$$= (17{,}201/166{,}830) = 0.1031$$

where:

$P_{eb}^{d}(91)$ is the 1991 Census population of ethnic group *e*, born in country of birth *b*, resident in district *d*

and

$\sum_{e} P_{eb}^{d}(91)$ is the total count of the 1991 population in country of birth group *b*, resident in district *d*.

This conditional probability can then be applied to the 1981 country of birth table data for the English country of birth group to give an estimate of the number of Black-Caribbeans in Lambeth at the time of the 1981 Census. A framework is provided below which illustrates this method. Table 2 shows a conceptual matrix of country of birth by ethnic group for a control area. Such a matrix can be derived from the 1991 Census of Population Local Base Statistics, 1991 Sample of Anonymised Records, the Labour Force Survey or the Longitudinal Study. The probabilities of belonging to each ethnic group given country of birth are calculated, and represented in the table as $p_{1,1}$ to $p_{16,16}$. Table 3 represents the 1981 Census Small Area Statistics country of birth data, each country of birth population represented as P_1 to P_{16}. Table 4 demonstrates how the conditional probabilities from Table 1 are applied to the corresponding country of birth data to yield new estimates.

Table 2: Conditional probabilities of belonging to an ethnic group given country of birth and control area

Country of Birth (COB)	Ethnic Group					
	White	Black-Caribbean	...	Other-Asian	Other-Other	All ethnic groups
England	$p_{1,1}$	$p_{1,2}$	...	$p_{1,9}$	$p_{1,10}$	100
Scotland	$p_{2,1}$	$p_{2,2}$	...	$p_{2,9}$	$p_{2,10}$	100
Wales	$p_{3,1}$	$p_{3,2}$	...	$p_{3,9}$	$p_{3,10}$	100
.	.	.	...	.	.	.
Other EC	.	.	...	.	.	.
Other Europe	.	.	...	.	.	.
Rest of World	$p_{16,1}$	$p_{16,2}$	...	$p_{16,9}$	$p_{16,10}$	100

Table 3: Population by country of birth, in Local Authority district, from the 1981 Census Small Area Statistics Table 4

Country of Birth (COB)	Population
England	P_1
Scotland	P_2
Wales	P_3
.	.
Other EC	.
Other Europe	.
Rest of World	P_{16}
All COBS	P

Table 4: Estimates of the 1981 population in Local Authority districts by country of birth and ethnic group calculated from Tables 1 and 2

Country of Birth (COB)	Ethnic Group				
	White	Black-Caribbean	...	Other-Asian	Other-Other
England	$p_{1,1}P_1$	$p_{1,2}P_1$	...	$p_{1,9}P_1$	$p_{1,10}P_1$
Scotland	$p_{2,1}P_2$	$p_{2,2}P_2$	...	$p_{2,9}P_2$	$p_{2,10}P_2$
Wales	$p_{3,1}P_3$	$p_{3,2}P_3$	...	$p_{3,9}P_3$	$p_{3,10}P_3$
.	.	.	...	.	.
Other EC	.	.	...	.	.
Other Europe	.	.	...	.	.
Rest of World	$p_{16,1}P_{16}$	$p_{16,2}P_{16}$	...	$p_{16,9}P_{16}$	$p_{16,10}P_{16}$

Source: Haskey, J. (1992)

3.1 A review of past methodologies: a logical progression

Haskey (1991) pioneered estimating the size of ethnic groups for the years prior to the 1991 Census using the conditional probability method. Ethnic group estimates were produced for 1981 at the county and metropolitan district scale using the Labour Force Survey (LFS) which is currently a 0.25 per cent sample of the British population (around 150,000 to 200,000 individuals). This survey asks questions about both ethnic group and country of birth. Therefore, it is possible to estimate the size of ethnic group populations using the cross-tabulation of ethnic group and country of birth to calculate the conditional probability of belonging to ethnic group *e*, given country of birth *b* and "area" of residence *d*. However, although the survey results at a national scale are reliable, this decreases as sub-populations are examined. As a result, the OPCS recommended that three successive surveys should be averaged when looking at ethnic minority groups or individual regions. Haskey used data for 1981 and 1986-88. Using this method and data set to estimate change over the intercensal period 1981-91, Owen (1995) demonstrated that this approach produces volatile trends for both regional estimates and metropolitan county estimates. It is concluded (Owen, 1995) that this is largely due to the spatially clustered sampling strategy adopted by the LFS. The survey sampled different local authority districts in different years, but larger cities remained in the sample over time. It was therefore possible that such a sampling

approach would miss individual ethnic groups over time and space, given that ethnic minority groups are strongly clustered. The problems with scale are also apparent. The main assumption in this method is that the relationship between country of birth and ethnic group (and therefore the conditional probabilities) is the same for each district within the control areas. However, this produces underestimations of ethnic group numbers in areas with high concentrations of such groups, and overestimations in areas with low numbers.

Rees and Phillips (1996) tackled this problem in their approach to estimating ethnic group change over the intercensal decade by using the 1991 Census to calculate the conditional probability matrix for each of the 459 local authority districts of Great Britain. Table L51 of the Local Base Statistics (LBS) provides a cross-tabulation of ethnic group by country of birth. Conditional probabilities can then be calculated from this matrix and applied to 1981 country of birth data to yield a set of ethnic group estimates. However, the major assumption in this approach is that the probabilities found in 1991 apply equally in 1981. This is clearly not the case. The calculation of conditional probabilities from 1991 data includes individuals who did not exist in 1981 i.e. those 0-9 year olds born in the intercensal decade. Therefore, this method alone is likely to produce an overestimate of ethnic minority populations. This was rectified to a certain extent by adjusting the 1981 estimates to ethnic group counts found in the LFS for the years 1979, 1981 and 1983.

Owen (1996) attempted to solve the problem of applying 1991 probabilities onto 1981 data by using the 1991 Census individual Sample of Anonymised Records (SAR). This is a 2 per cent sample of the population which allows the cross-tabulation of country of birth by ethnic group by age. It is the latter dimension which adds the value to this method. Conditional probabilities derived for the population who were aged 10 and above at the time of the 1991 Census eliminate those born in the decade 1981-91. If these conditional probabilities are then applied to the 1981 country of birth data, more accurate estimates can be produced as this method does not use people who were not born in 1981 in the calculation of the matrices. However, this method continues the assumption that the 1991 probabilities applied in 1981 as well i.e. that the population had remained geographically stationary over the decade 1981-91. In reality, many people will have experienced migration. Both LBS and SAR conditional probabilities based on the 1991 Census fail to take into account persons present in the 1981 Census population but not in the 1991 Census, mainly older people who have died and emigrants. These outflow populations are likely to have had higher conditional probabilities of being White given birth in the UK, leading again to an underestimate of Whites and an overestimate of ethnic minorities.

3.2 The contribution of the Longitudinal Study to the estimation process

The Longitudinal Study (LS) contains linked census and vital events data on a 1 per cent sample of the population of England and Wales. Data from the 1971, 1981 and 1991 censuses are linked, with selection criteria being that of birth date (four equidistant dates in the year are used). It is designed as a continuous, multi-cohort study, with subsequent samples being drawn from each census and linked to the study. Entrance to the study is via birth or immigration, and exit is through death or emigration.

The value of the LS to the estimation methodology in this project is the linkage of records. It is possible to extract 1981 ethnic group data from the LS database as these are linked to 1991 when ethnicity was recorded for each individual assuming that LS members would not have changed their minds about their self-reported ethnicity between Censuses. Thus, if the 1981 LS data are used to compute the conditional probabilities used in the estimation routines, then the assumption that the population remains static over the intercensal period can be disregarded.

However, one disadvantage of using the LS is in the "ethnicity linkage". For a person who exists in 1981 to be allocated an ethnic group it is necessary that he/she existed in 1991 when ethnicity was recorded. It is the case that in the intercensal years, the population will be subject to mortality and emigration. This means that in effect there will have been those who existed in 1981 who cannot be allocated a 1991 ethnic group, as they did not survive the decade or emigrated.

Another drawback in using the LS is that data cannot usually be extracted at a Local Authority District scale, due to confidentiality constraints. Thus, data for Inner and Outer London have been extracted for this project, and conditional probabilities calculated for these two "regions" [1].

The estimates have been produced using the three data sets:

i. Census Local Base Statistics Table L51 (country of birth by ethnic group by local authority district/borough)
ii. Census 2 per cent Individual Sample of Anonymised Records (individuals aged 10 and over: country of birth by ethnic group by local authority district/borough)
iii. Longitudinal Study (country of birth by ethnic group by Inner/Outer London)

Each country of birth by ethnic group matrix was used to calculate the conditional probability of belonging to ethnic group *e* given country of birth *b* and borough *d*. These probabilities were then applied to 1981 Census Small Area Statistics Table 4 country of birth data, adjusted to sum to 1981 mid-year estimates, to yield the ethnic group estimates.

A step-by-step breakdown of each procedure is presented below.

3.3 Algorithm for creating 1981 ethnic group estimates

Step 1

The base population from which the conditional probabilities are to be calculated is input (either the 1991 Census LBS data, the 1991 SAR 10+ sample, or the 1981 LS country of birth by ethnic group data).

Definitions:

$B^{d}_{eb}(91)$ = base counts B by borough d, ethnic group e and country of birth b

Step 2

The conditional probability of being a member of ethnic group *e* given country of birth *b* and resident in borough *d* is computed, using the base population counts.

Definitions:

$p(e|b,d)$ = the conditional probability of being a member of ethnic group *e* given country of birth *b* and resident in borough *d*

Method:

$$p(e|b,d) = B^{d}_{eb} \Big/ \sum_{e} B^{d}_{eb}$$

Step 3
The 1981 Census Small Area Statistics for boroughs/districts d and country of birth b are input.

Definitions:

$C_b^d(81)$ = the 1981 Census Small Area Statistics for boroughs b and country of birth b

Step 4
The 1981 SAS country of birth counts are multiplied by the 1991 conditional probabilities to yield a 1981 country of birth by ethnic group matrix.

Definitions:

$C_{eb}^d(81)$ = 1981 Census population estimate for persons of ethnic group e and country of birth b, resident in borough d

Method:

$$C_{eb}^d(81) = p(e|b,d)\, C_b^d(81)$$

Step 5
Input the 1981 Census mid-year district estimates. The matrix counts are adjusted to sum to the 1981 mid-year district populations.

Definitions:

$P^d(81)$ = mid-1981 borough population

$P_{eb}^d(81)$ = mid-1981 population estimate for persons of ethnic group e and country of birth b, resident in the corresponding borough d

Method:

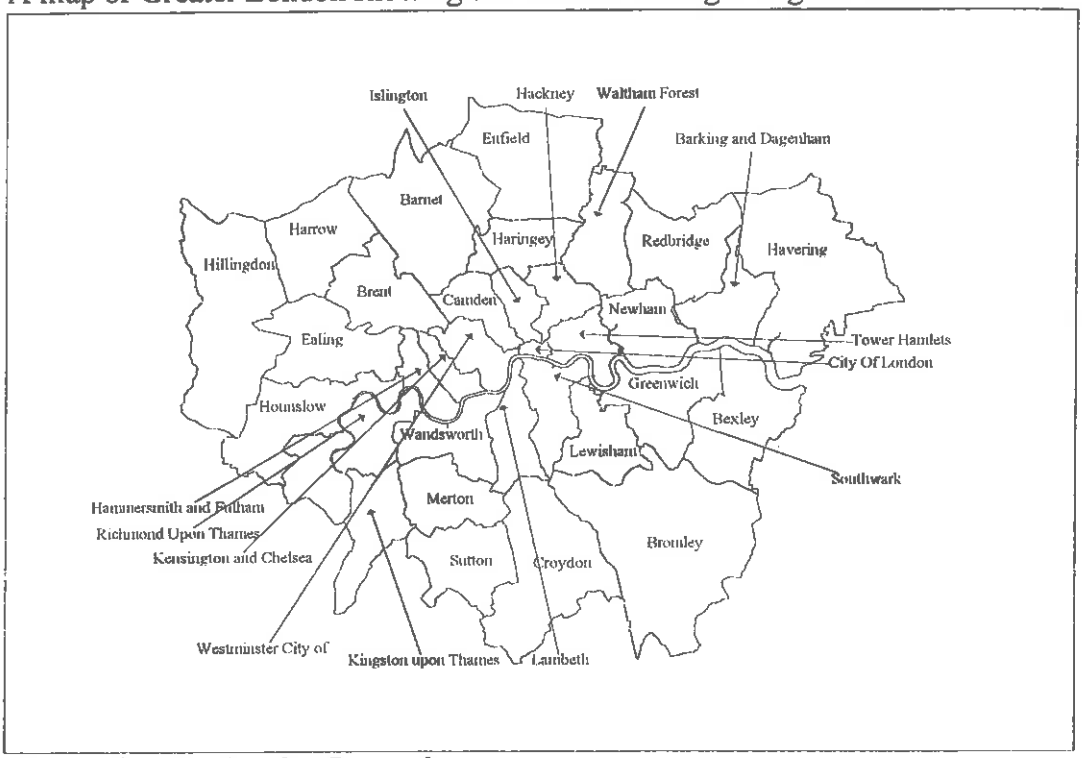
$$P_{eb}^d(81) = C_{eb}^d(81)\left(P^d(81)\Big/\sum_e\sum_b C_{eb}^d(81)\right)$$

4 ETHNIC GROUP POPULATION ESTIMATES FOR LONDON BOROUGHS 1981

Estimates have been produced for each Greater London borough. The boroughs of City of London and City of Westminster have been amalgamated due to sparse counts and compatibility with the SAR data set. The full results can be found in Appendix A. The results section is divided into two parts: the first reports the actual 1981 ethnic group estimates and attempts an evaluation of each; the second reports the consequent spatial change over the period 1981 to 1991.

4.1 Results: 1981 ethnic group estimates

A map of Greater London showing the London boroughs is given below for reference (Map 1).



Map 1: Greater London Boroughs

The following Table 5 presents results from each of the three estimation routines*.

Table 5: Inner and Outer London ethnic group population estimates for 1981 produced by three different estimation routines

	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO	Total Minorities
Inner London											
LBS Method	1937155	205252	91196	51882	75952	28855	44517	24922	36688	53670	612934
SAR Method	2020291	195418	74510	39840	67751	23535	29951	22718	33372	42709	529804
LS Method	2076774	183344	40440	30813	84689	22516	24356	21128	29602	36446	473334
Outer London											
LBS Method	3605637	116174	46806	32227	255782	54301	10058	24754	51990	57776	649868
SAR Method	3706467	107157	38380	22952	212521	43447	7438	23306	47073	46732	549006
LS Method	3797743	84891	16294	19312	210428	35872	5695	18897	29968	36406	457765

** the abbreviated ethnic groups read as: Wh White; BC Black-Caribbean; BA Black-African; BO Black-Other; In Indian; Pa Pakistani; Ba Bangladeshi; Ch Chinese; OA Other-Asian; OO Other-Other.*

The three estimates produce very different counts for the ethnic group populations. This is represented graphically in Figures 1 and 2, which show the population estimates for ethnic minority groups, produced by the different estimation routines.

The data for Inner London (Figure 1) show the method which produces the greatest counts for the ethnic minority populations is the LBS Census method estimate. The SAR method and the LS method produce lower estimates for each ethnic minority group, with the latter yielding the most conservative estimates of the three routines. This is the case for all minority groups, with the exception of the Indian group. The LS method generates the greatest estimate for this group, and the SAR estimate the lowest.

Figure 1: Ethnic group population estimates for Inner London 1981

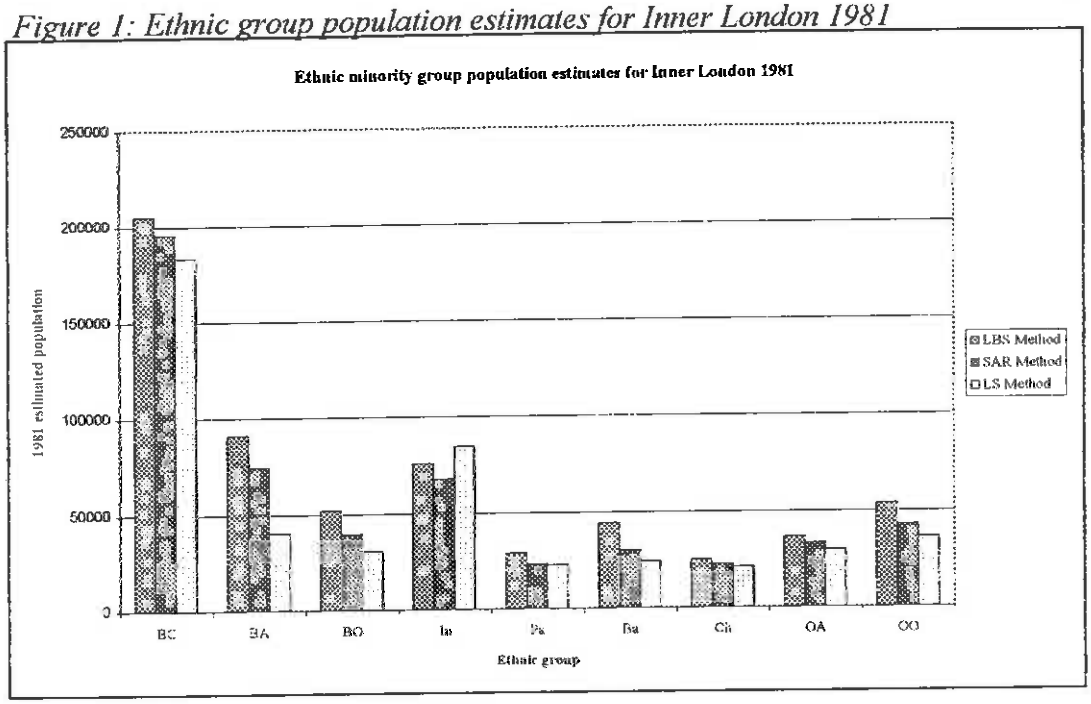
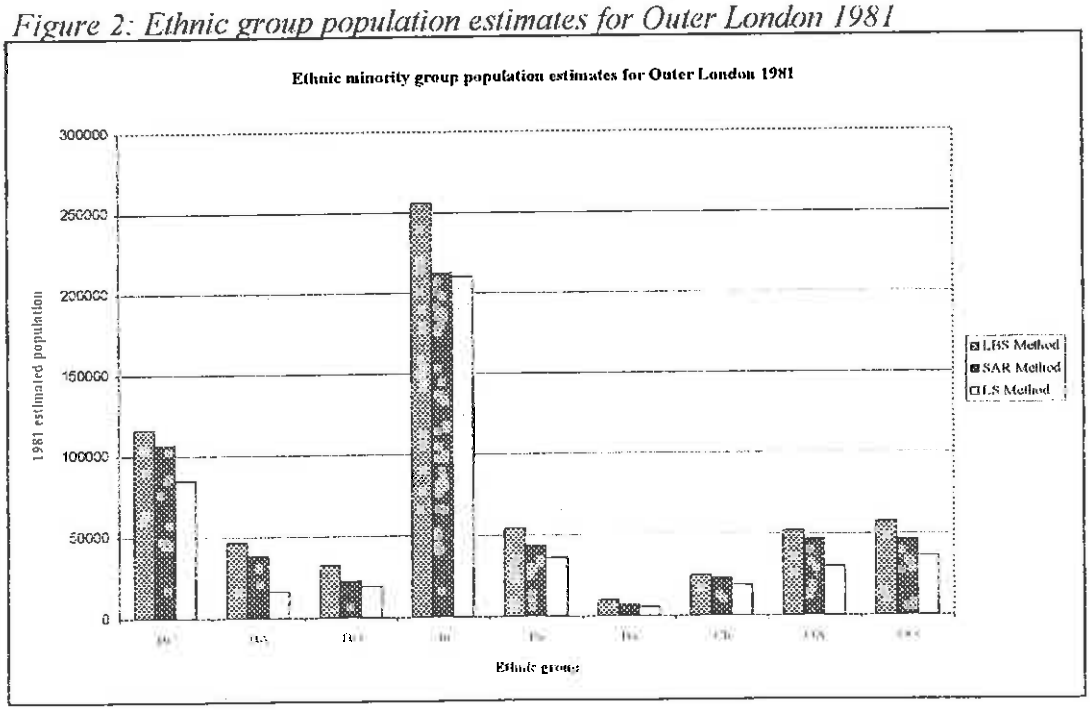


Figure 2: Ethnic group population estimates for Outer London 1981



It is also apparent from the graph that the SAR and LS estimates for the Asian groups are quite similar, with the exception of the Indian group. This is especially true for the Pakistani and Chinese groups. In contrast the Black-African group estimates are very dissimilar.

Figure 2 shows the corresponding information for Outer London. Again it is the case that the greatest estimates are generated by the LBS method and the more conservative by the LS method. The Black-Other, Indian and Chinese SAR and LS estimates are very similar.

It is important at this juncture to note that the estimated sizes of the populations produced by the three estimation routines consequently affect the size of the change in these groups over the estimation time period.

As stated above, the LBS method yields the greatest estimates of ethnic minority populations and the LS method the smallest. Consequently, the population change data presented in section 4.4 shows that this translates into the smallest absolute changes being estimated by the LBS method, and the largest changes being generated by the LS method.

However, the LS Indian estimate for Inner London is greater than both the LBS and SAR estimates. An examination of the conditional probability calculations used in the estimation model points to the cause of this anomaly. Table 6 below compares the conditional probabilities of belonging to the Indian group and residing in Inner London in 1981 given the differing country of birth groups for each of the three estimation routines.

Table 6: The conditional probability of belonging to the Indian group, given the differing countries of birth and residence in Inner London in 1991

Country of Birth	*Conditional Probability*		
	LBS	SAR	LS
England	0.02	0.01	0.01
Scotland	0.00	0.00	0.00
Wales	0.00	0.00	0.01
Rest of UK	0.00	0.01	0.02
Irish Republic	0.00	0.00	0.00
Old Commonwealth	0.00	0.00	0.00
NC Africa	0.17	0.18	0.44
NC Caribbean	0.02	0.02	0.01
NC India	0.75	0.75	0.73
NC Bangladesh	0.00	0.00	0.01
NC Far East	0.06	0.06	0.09
NC Medit/Rem	0.04	0.03	0.03
Pakistan	0.03	0.04	0.05
Other EC	0.00	0.00	0.00
Other Europe	0.00	0.00	0.01
Rest of World	0.01	0.01	0.03

It is evident that there are slight differences in the probabilities, which is to be expected, except for one country of birth group, namely the New Commonwealth (NC) African group. The LBS and SAR methods produce conditional probabilities of 0.17 and 0.18 respectively, whereas the LS method yields a figure of 0.44.

The reason for the anomalous results lies in the data structure. In compiling and formatting the input data for the estimation routines, it is highly desirable that the country of birth groupings are the same as the 1981 Census SAS Table 4 categories, as the conditional probabilities computed using the former are mapped onto the latter. It is possible to collapse certain country of birth categories into a larger grouping, providing the grouping contains the same countries of birth as the comparable counterpart. For example, to make the 1991 LBS Table 51 comparable with the 1981 SAS countries of birth, it is necessary to add the USA, China and Vietnam counts to the Rest of World category to replicate the 1981 Rest of World grouping. Therefore, this requires a uniform set of country of birth groupings for each of the LBS, SAR and LS data sets. This proved problematic with the SAR data set. Table 7 below shows the constituent countries of birth for the NC East Africa and NC Africa Remainder country of birth groups for each of the three estimation input data sets.

Table 7: The constituent countries of birth for each of the NC Africa country of birth groupings from each of the three input data sets

LBS		SAR		LS	
NC East Africa	*NC Africa Rem*	*NC East Africa*	*NC Africa Rem*	*NC East Africa*	*NC Africa Rem*
Kenya	Zimbabwe	Kenya	Nigeria	Kenya	Zimbabwe
Malawi	Botswana	Uganda	Malawi	Malawi	Botswana,
Tanzania	Lesotho		Tanzania	Tanzania	Lesotho,
Uganda	Swaziland		Zambia	Uganda	Swaziland
Zambia	Gambia		Zimbabwe	Zambia	Gambia
	Ghana		Botswana		Ghana
	Nigeria		Lesotho		Nigeria
	Sierra Leone		Swaziland		Sierra Leone
			Gambia		
			Ghana		
			Nigeria		
			Sierra Leone		

This shows that both the LBS and LS country of birth groupings contain the same African country of births, and that the SAR grouping differs, the NC Africa Remainder group containing NC East African country of births. In order to make the three sets of input data comparable, the NC East Africa and NC Africa Remainder country of birth groups were amalgamated to create a new country of birth category, namely NC African. It is this amalgamation which has caused the anomalous estimation results for the Inner London Indian group. This can be demonstrated by the production of a new set of estimates, shown graphically below (figures 3 and 4).

Figure 3: Ethnic minority group population estimates for Inner London 1981, calculated using disaggregated NC African country of birth data

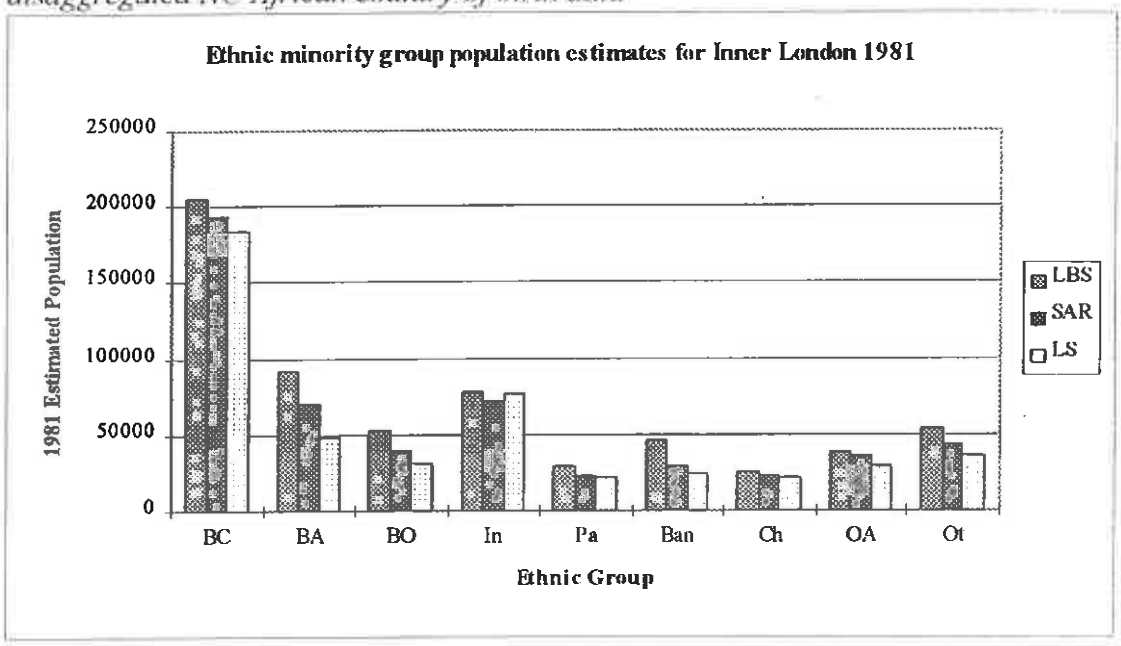
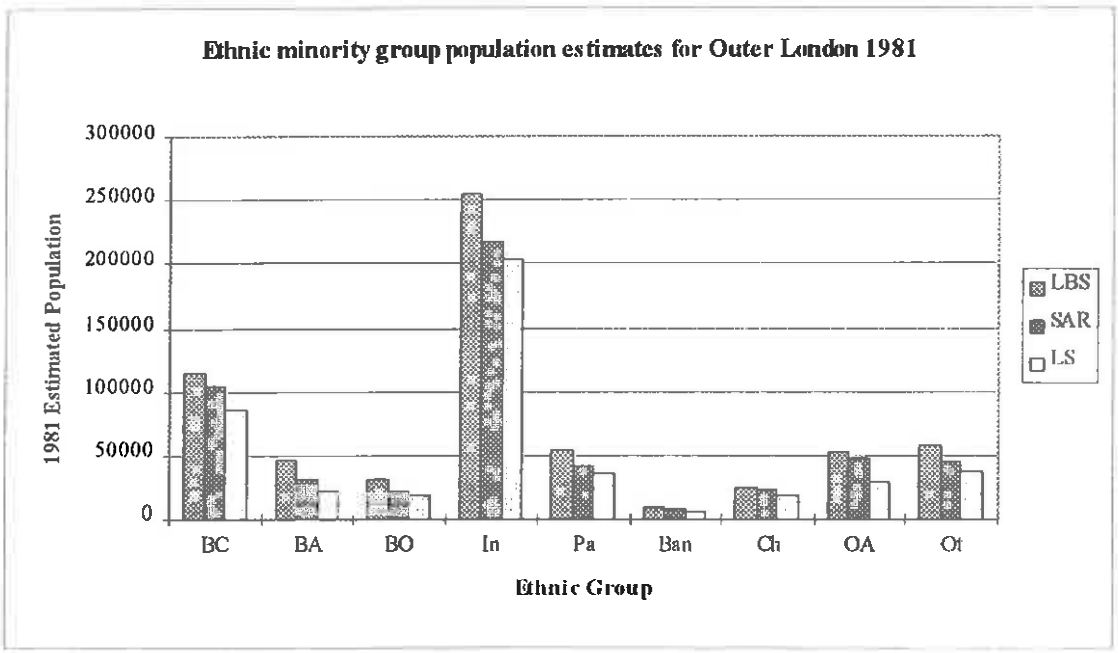


Figure 4: Ethnic minority group population estimates for Outer London 1981, calculated using disaggregated NC African country of birth data



The production of this set of estimates *does not* amalgamate NC East Africa and NC Africa Remainder. The most notable change in the estimates is that seen in the smaller LS estimate of the Indian group. Table 8 below shows the effect of the disaggregation of the NC Africa grouping to NC East Africa and NC Africa Remainder on the estimates of the Indian group size.

Table 8: The effect of the amalgamation of NC African country of birth data on the 1981 LS estimated size of the Indian group residing in Inner London

COB Grouping	*Conditional Probability*	*1981 Census SAS Count*	*Estimates*
NC East Africa	0.7570	25128	19022
NC Africa Rem	0.0065	35496	232
			Tot: 19254
NC Africa	0.6254	60624	**Tot: 37915**

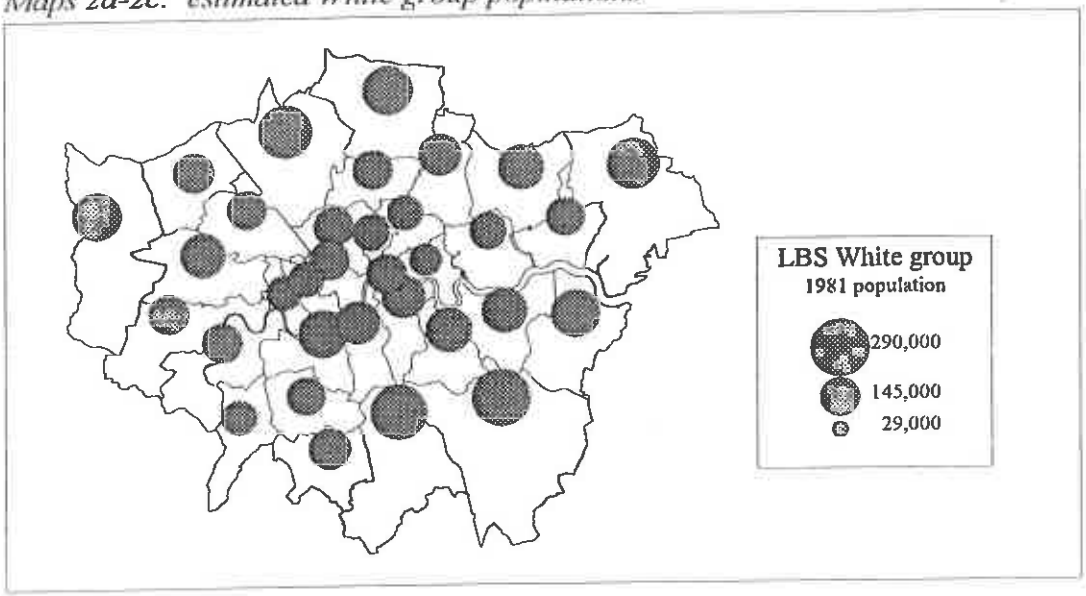
Applying the conditional probability of 0.6254 (calculated from the combined NC Africa data) to a 1981 Census NC Africa count of 60624 yields a greater estimate than calculating the conditional probabilities separately for NC East Africa and NC Africa Remainder and applying them to the disaggregated 1981 country of birth data. It is likely that the disaggregation of the NC Africa country of birth grouping into NC East Africa and NC Africa Remainder and the subsequent calculation of conditional probabilities will provide an estimate closer to the "truth" than the amalgamated data.

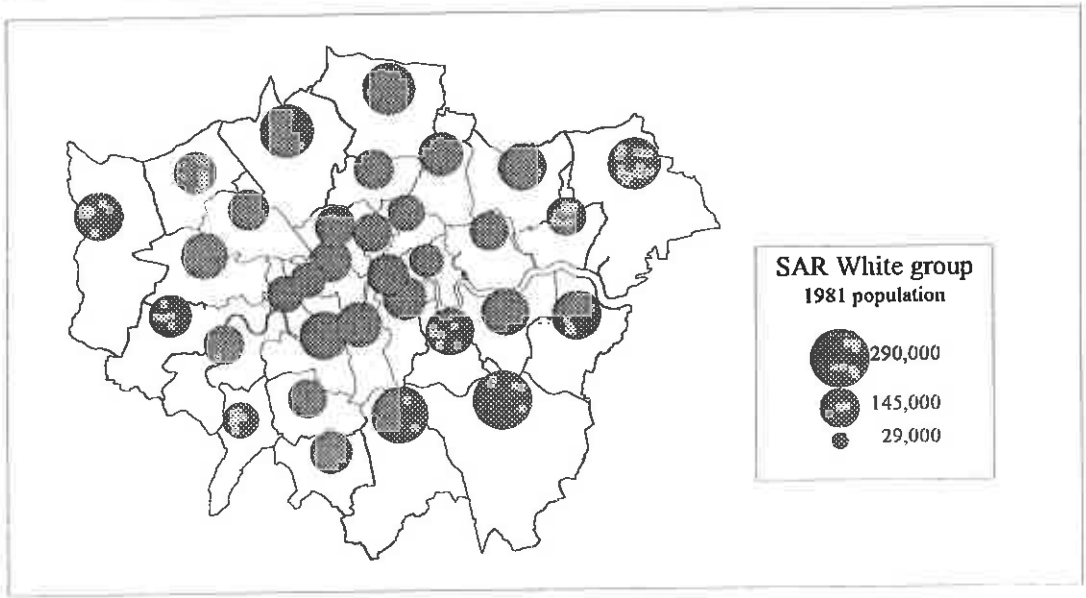
The disaggregation of the SAR NC Africa country of birth data to its constituent NC East Africa and NC Africa Remainder proves less successful. As previously stated, the SAR NC Africa Remainder contains population counts which should be allocated to the NC East Africa country of birth group. If this were possible, it is likely that the transfer of the NC East Africans to their correct group would produce a much greater probability of being a NC East African Indian, and yield an estimate more in line with those produced by the LBS and LS methods. However, this is not possible, and the resulting distortion of the conditional probabilities casts doubt on the validity of the SAR set of estimates.

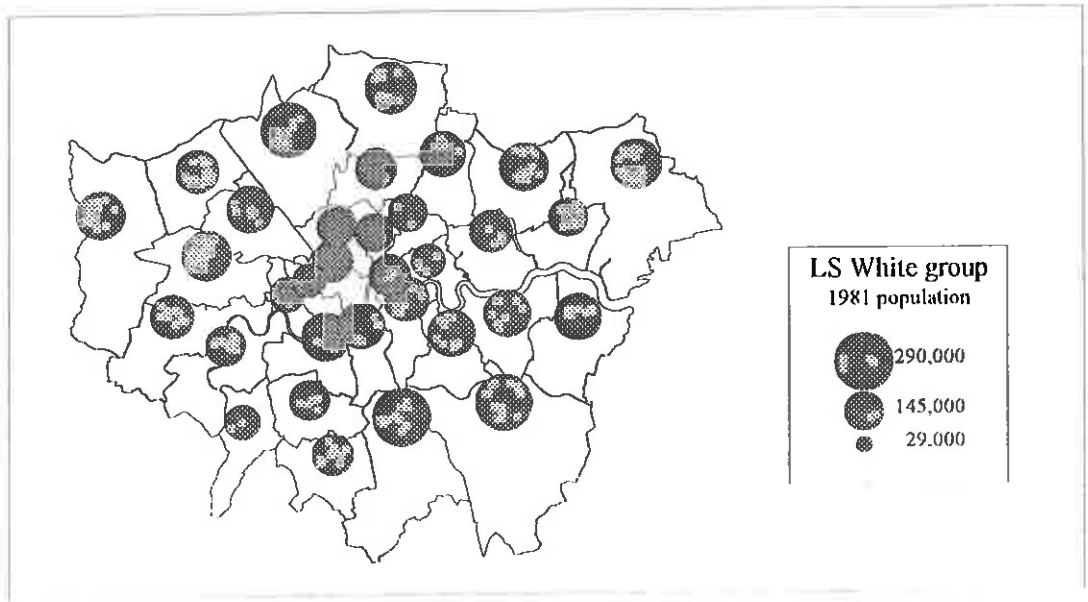
It is possible to examine each set of estimates spatially. The following twelve maps allow an analysis of the estimates for each borough. Four maps have been produced for each set of estimates, and show, in absolute numbers:

i. estimated 1981 distribution of the White group
ii. estimated 1981 distribution of the Black groups
iii. estimated 1981 distribution of the South Asian groups
iv. estimated 1981 distribution of the Chinese, Other-Asian, and Other-Other groups

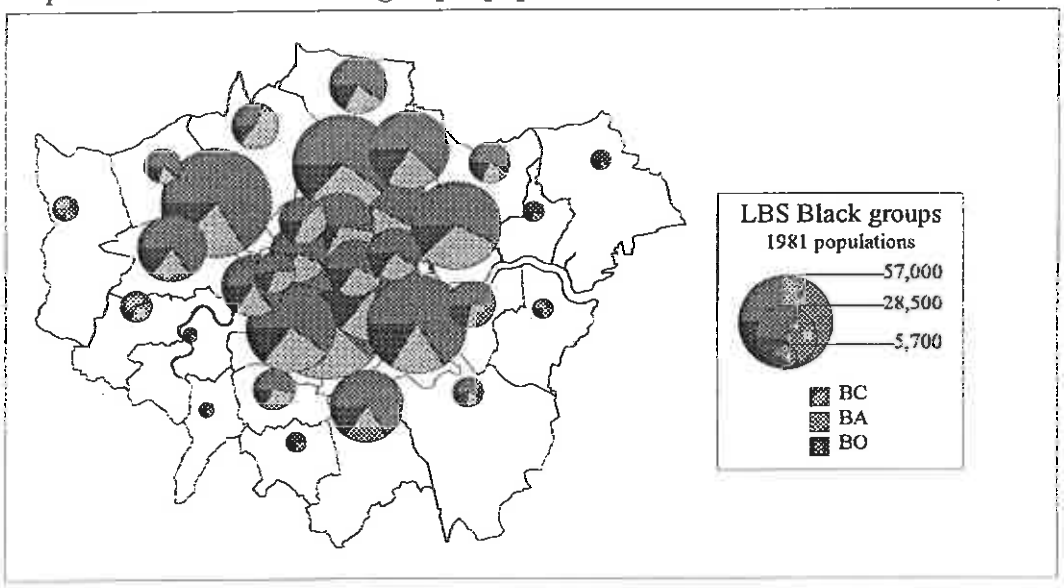
Maps 2a-2c: estimated White group populations

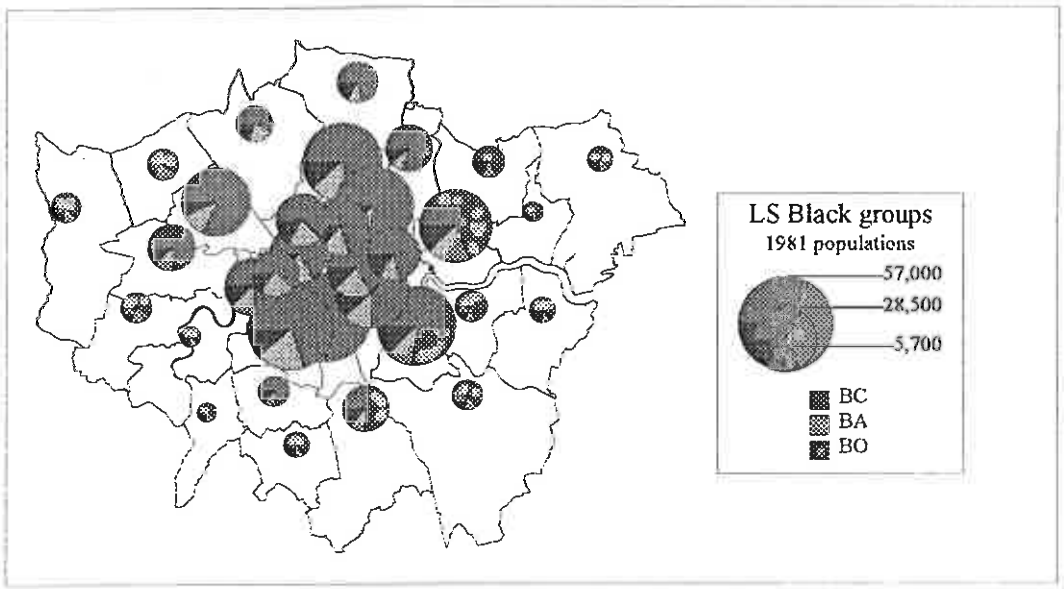


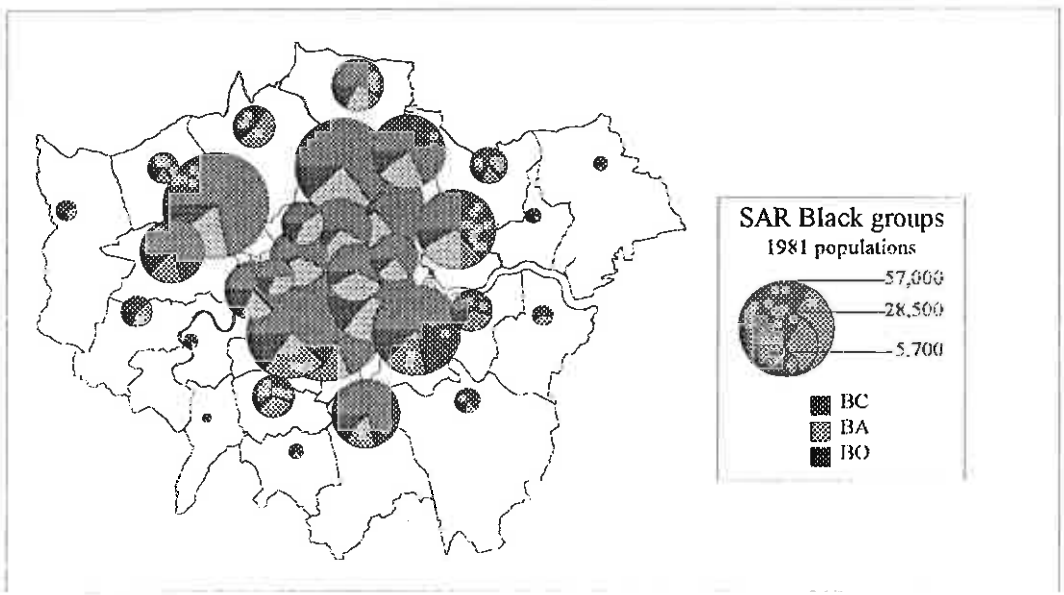




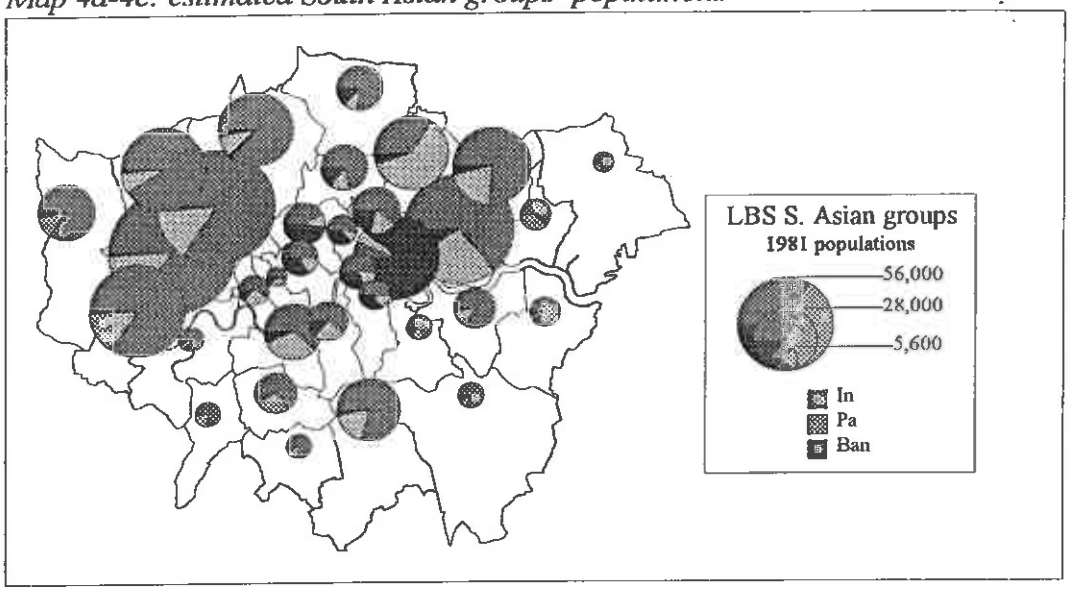
Map 3a-3c: estimated Black groups' populations

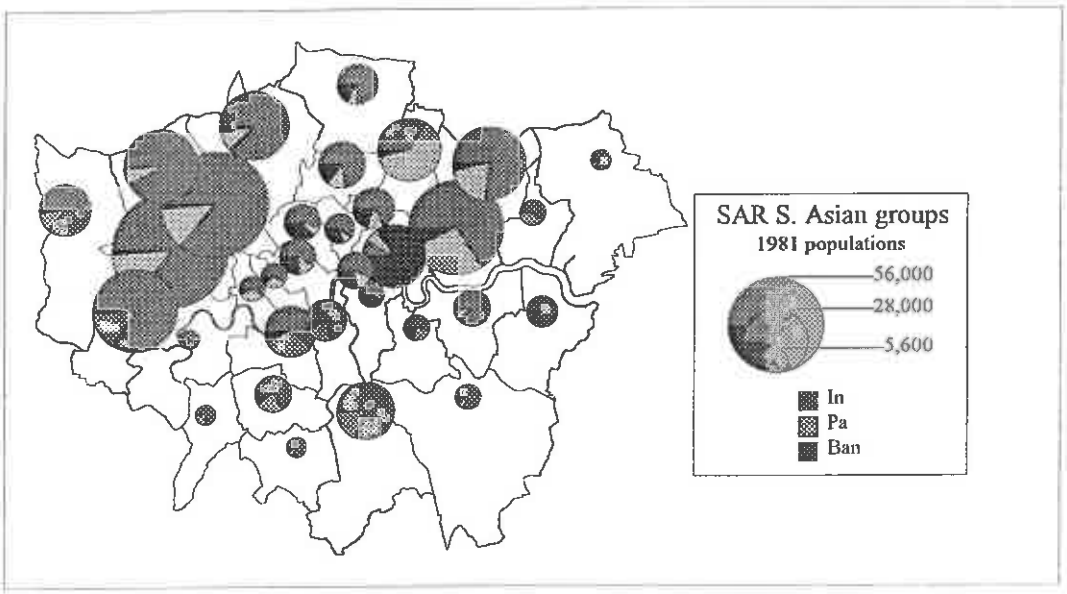


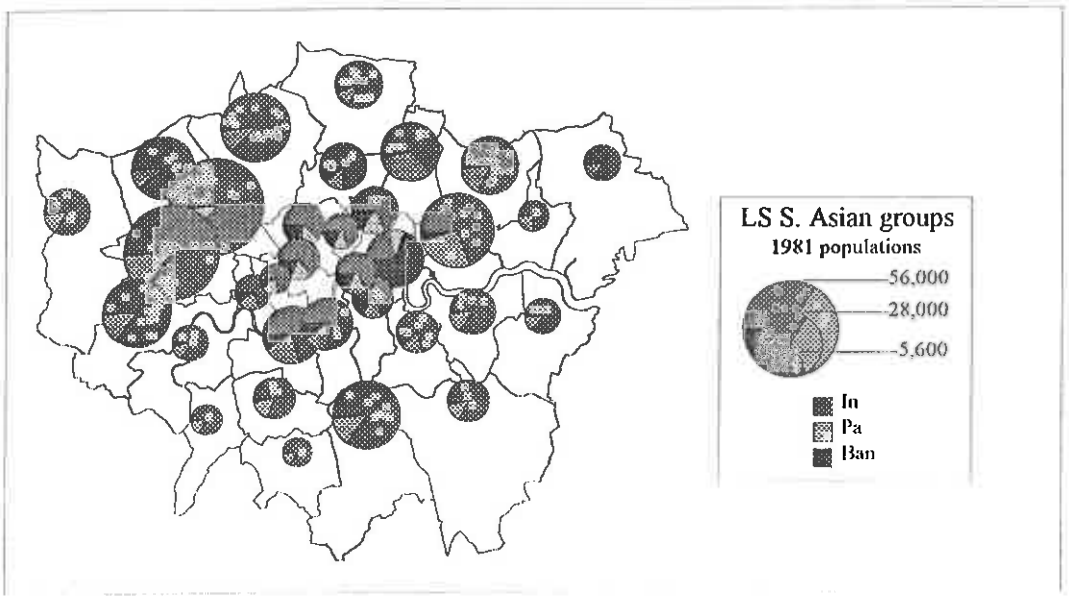




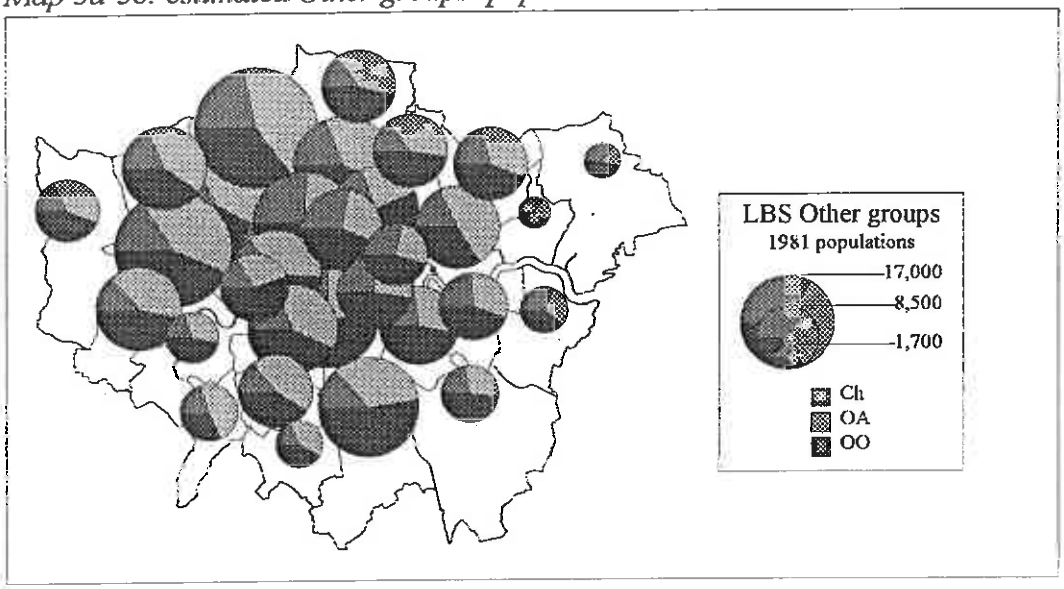
Map 4a-4c: estimated South Asian groups' populations

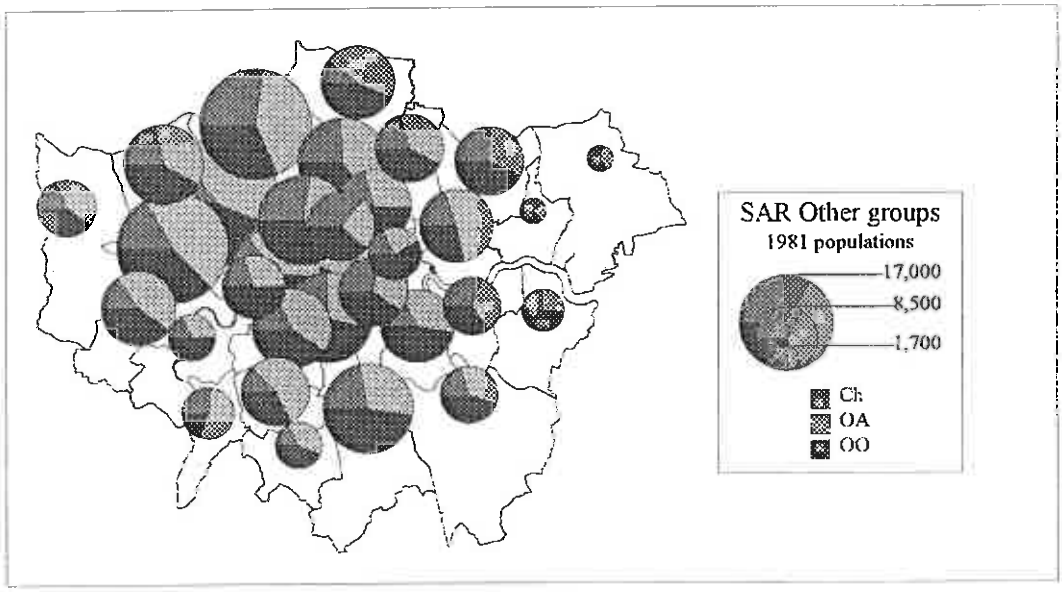


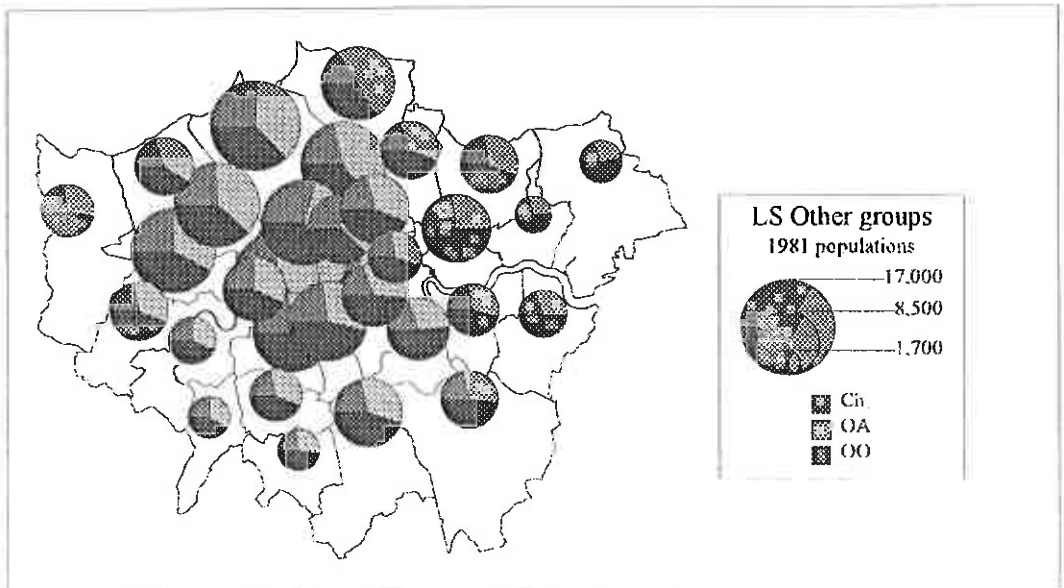




Map 5a-5c: estimated Other groups' populations







The White group

An examination of the estimates from the LBS and SAR methods reveals that the overall spatial pattern of concentration of the White group is very similar in both sets of results. These two sets of estimates show the largest numbers of the White group to be concentrated to the north-west of Outer London towards the Hertfordshire border (Hillingdon, Harrow, Barnet and Enfield), and in the peripheral south-east boroughs of Bromley, Bexley and Havering. However, the two estimates differ in the size of the populations. Without exception, the SAR method produces a greater estimate for each borough than the LBS method. If ranked in order of magnitude of the White populations, the order of boroughs is very similar for both estimates, each reporting the same top 15 boroughs. The vast majority of the LS estimates are greater than the LBS estimates and the SAR estimates, although the top 15 rankings are generally very similar.

The Black groups

There has been a continuous presence of Black Londoners since at least the middle of the sixteenth century (Faizi, 1986), mainly associated with the English slave trade and the plantations of the English Caribbean. However, the past 200 years has seen this pattern evolve into one of immigration by African and Caribbean students and sailors (Storkey and Lewis, 1996).

More recently, the 1950s saw the start of the major immigration period of the Caribbean group from the former British colonies. It is the initial settlement patterns of this period that had a significant effect on the development of the south London Black community (Lambeth Council, 1988). The main factors influencing this wave of immigration were high levels of unemployment in the Caribbean coupled with the post-war economic expansion in the UK, and a tightening of US immigration controls. The influx of migrants peaked in 1961, but started a decline after the 1962 Commonwealth Immigrants Act (Storkey and Lewis, 1996).

Migration from Africa was prompted by the effects of independence in a number of Commonwealth countries and the political and economic uncertainties that followed (Storkey and Lewis, 1996). Originally, many migrants arrived as students, a factor that remains very important to the composition of this group to the present day.

The three estimation maps for the Black groups show the total geographical spread of these groups, sub-divided proportionally into the Black-Caribbean, Black-African and Black-Other components.

In examining the LBS estimated spread of the Black groups it is evident that the dominant Black group in the vast majority of boroughs is the Black-Caribbean group. The map also shows that this group is followed proportionally by the Black-African group. The largest numbers of the Black group are estimated to be concentrated in the Inner London boroughs of Lambeth, Southwark, Wandsworth and Lewisham to the south of the River Thames, and Haringey, Hackney and Newham to the north. However, it is also estimated that large Black communities are not confined to Inner London. Brent and Ealing both show substantial members of these groups.

The estimates generated by the SAR routine mirror the spread of the Black groups, although, as expected, produce smaller counts for each group. For example, the borough with the largest

estimated Black community in each routine is Lambeth. The LBS routine reports this borough to be home to 35,045 Black-Caribbeans, whereas the SAR routine estimates this number to be 33,176. This is the case for each of the Black groups for each borough. As such, the pattern of Black group concentration for the SAR estimates is the same as the LBS method estimates, but corresponding counts for the latter are greater.

Overall, the spatial extent of the Black groups reported by the LS estimation method is similar to the patterns described above. The boroughs containing the greatest numbers of the Black groups as a whole are to be found in the Inner London boroughs of Wandsworth, Lambeth, Lewisham and Southwark, and in Haringey, Hackney and Newham to the north of the River Thames. However, if the composition of each Black community is examined, a slightly different picture emerges. Although proportionally, the Black-Caribbean group makes up the greater part of the communities, it is apparent that when this proportion is compared with those of the LBS and the SAR estimates the LS share is greater. This is particularly true for the boroughs with the larger Black communities.

If the overall sizes of the estimates are compared, the LS routine tends to be more generous in the generated estimates, whereas the SAR method tends to be the more conservative.

The South-Asian groups

South-Asian net migration only really started to increase in London in the 1950s and 1960s, in response to a growing economy and a post-war labour shortage. Prior to this, London had played a lesser, although important role in the South-Asian migrant settlement process. Migrants came to London recruited as servants or seamen from the Punjab, Bengal or the west coast of India. The middle of the nineteenth century saw the arrival of Asian professionals, and the political upheaval following the partition of India in 1947 provoked further post-war migration (Storkey and Lewis, 1996).

Each of the three estimates produced by the different routines show the South-Asian groups' geographical spread to differ greatly from that of the Black groups'.

Taking the LBS estimates first, it can be seen that the largest concentrations of South-Asian groups are located in the Outer London boroughs, namely Hillingdon, Harrow, Barnet, Brent, Ealing and Hounslow to the north-west of the region. Another pocket of concentration can be seen in the Inner boroughs of Tower Hamlets and Newham.

It is the case that the Indian group makes up the greatest proportion of the South-Asian population in the majority of the boroughs. Certainly this is the case for all the Outer London boroughs. It is estimated that the Bangladeshi group tends to be underrepresented in the Outer boroughs. However, the map shows the concentration of this group in the central Inner boroughs, the greatest accumulation being found in Tower Hamlets (23,987). Newham and Waltham Forest show substantial counts of the Pakistani community (11,683 and 12,966), which is otherwise concentrated in Hounslow, Ealing and Brent.

The SAR estimates for South-Asian groups follow the same spatial concentration pattern as the LBS estimates. Again, it is the case that the SAR estimates tend to be lower than the LBS estimates. For example, the count of Indians in Ealing according to the SAR estimate is 39,358, whereas the corresponding count for the LBS estimate is 47,205. The same comparison for the

number of Bangladeshis in Tower Hamlets shows a LBS estimate of 23,987 and a SAR estimate of 14,597.

The LS estimates mirror the patterns of spatial concentration of the South-Asian groups as a whole described in the analysis of the LBS and SAR estimates above. However, there are differences when each component ethnic group is examined. The dominance of the Indian group is still reproduced, but the proportional representation of the Pakistani and Bangladeshi groups tends to differ. An example of this can be seen in the borough of Waltham Forest. The SAR estimate for the Pakistani population here is 10,654 whereas the corresponding LS estimate is 5,096. The Bangladeshi population of Tower Hamlets also experiences a similar effect, the SAR estimate reporting a population of 14,597, the LS method producing a count of 10,141.

Overall, it is the case that the LS routine generates smaller estimates of South-Asian groups than both the LBS and the SAR routines.

Other group

It is possible that Chinese settlement in London dates back 200 years. The growth of this group in London and Great Britain is linked to the growth of the Chinese catering trade, originated by ex-seamen. The reunion of families through migration together with the developing catering trade and the resettlement of the Vietnamese "boat-people" (at least 50 per cent of them ethnic Chinese) have helped influence the development of the community (Storkey and Lewis, 1996).

The Other group consists of Chinese, Other-Asian and Other-Other (i.e. other non-Asian). Spatially, this grouping is concentrated in the Inner London boroughs and the boroughs to the north-west of the region. The south-east periphery accounts for the smallest numbers (Bromley, Bexley, Barking and Dagenham, and Havering). The greatest concentrations can be found in the neighbouring boroughs of Barnet, Brent and Ealing.

The LBS estimates show that the Chinese form the smallest proportion of the Other group in each borough, which is generally dominated by the Other-Other group in the Inner boroughs. Greater proportions of Other-Asians tend to be concentrated towards the north-west of the region.

A comparison with the SAR estimates shows a very similar picture. Both sets of estimates show the same spatial pattern of concentration and also a broadly similar pattern of group composition in each ward.

The LS estimates are again broadly similar both spatially and compositionally. However, the overall grouping estimates are found to be lower for the LS in the majority of cases than for the LBS or SAR estimates.

4.2 Results: an explanation

As previously stated, the inclusion of a SAR estimation routine allows the isolation of the sample population that existed in 1981 by choosing to use only those aged 10 or over and the consequent calculation of the conditional probabilities. It is this age selectivity which excludes those born in the intercensal 1981 to 1991 decade, which may distort the computations. In each case the ethnic minority group SAR based estimates are smaller than those produced by the LBS

estimation routine. Conversely, the results for the White group show the SAR results to be greater than those produced by the LBS routine. This is the result of the age selectivity in the estimation process. The ethnic minority groups tend to have a younger age structure than that of the White group. This means that there will be a greater proportion of infants in ethnic minority groups than in the White group, leading to smaller conditional probabilities being calculated for ethnic minority groups than for the White group.

The LS allows estimates to be produced in which the computations of conditional probabilities are 1981 location specific, thus disregarding the stationary population assumption. However, the LS produces estimates that are very different to the LBS and SAR results, which both display a certain degree of homogeneity. The LS estimates are compared to those produced by the LBS and the SAR methods that use a base population at the borough scale to compute the conditional probabilities central to the estimation method. Both the 1991 LBS and the 1991 SAR are geographically comparable to the 1981 SAS data, onto which the corresponding conditional probabilities are mapped. That is, both the LBS and SAR methods produce 32 matrices each (one per borough) which is consequently applied to the 32 1981 SAS Table 4 counts of population by country of birth. Thus, the LBS and SAR matrices are matched with the corresponding spatial country of birth data for 1981. However, the LS data are only available for Inner and Outer London, so only two conditional probability matrices are produced[1]. The Inner London matrix is applied to each of the 1981 Inner London boroughs' data, and the Outer London matrix to the 1981 Outer London boroughs' data. This in turn produces a "geographical smoothing" of the results. In effect, the spatial constraint of the LS is producing a conditional probability matrix that is an average of all the boroughs located within the Inner/Outer London control areas. Therefore, this method is based on the assumption that the conditional probability of belonging to ethnic group e given country of birth b is the *same* for these boroughs within Inner London and for those located in Outer London. Obviously, this is not the case. The relationship between ethnic group and country of birth will be very different from borough to borough, especially given ethnic groups' strong propensity to cluster geographically. This results in underestimations of the ethnic group population size in boroughs with high concentrations of such groups, and overestimations in areas of low concentration. This can be illustrated by the example of Tower Hamlets, an established borough of Bangladeshi settlement, with 44 per cent of Greater London's Bangladeshi population living there in 1991. It is the case that the SAR estimation routine yields a count almost 50 per cent greater than that of the LS.

4.3 An evaluation: comparison of estimates with 1981 NCWP data

One of the main difficulties in producing ethnic group estimates for 1981 is that there is no independent measure of comparable ethnicity at the local scale against which to measure their accuracy. In this section the assumption is made that the 1981 surrogate measure of ethnicity, that of persons residing in a household whose head was born in the New Commonwealth or Pakistan (NCWP), is reasonably accurate, given that OPCS estimated that 95 per cent of the ethnic minority population still lived in such households in 1981 (Owen, 1996). The following analysis is only a broad indicator of the accuracy of the estimates. It is dangerous to assume the 1981 NCWP Census counts are too accurate (Owen, 1996). It is the case that a significant number of New Commonwealth-born household heads were White in 1981 (approximately 15 per cent of those born in India were White). Therefore, this surrogate measure of ethnicity may lead to overestimates of the ethnic minority population in some areas. In contrast, this measure does not include British-born household heads who were ethnic minority group members. It is likely that these individuals resided in areas with a history of ethnic minority settlement,

resulting in the underestimation of ethnic minority group numbers in such areas. The above analysis is therefore only intended to be an approximate measure to assess the performance of each set of estimates.

Table 9 below compares the percentage 1981 Census NCWP population with the three estimated ethnic minority percentages for 1981 for Inner and Outer London and each borough. This shows that for Inner and Outer London as a whole, the LS estimates are closer to the 1981 NCWP percentages than the LBS and the SAR percentages. The LBS estimates produced estimates that were the most different.

Table 9: Estimates of percentage ethnic minority populations, London 1981

Borough	1981 Census (%)*	1981 Estimate (%)		
		LBS Method	SAR Method	LS Method
Inner London	***18.7***	***24.0***	***20.8***	***18.6***
City and Westminster	11.3	18.4	16.5	17.6
Camden	10.1	15.6	13.8	15.8
Hackney	27.5	33.4	29.2	21.8
Hammersmith and Fulham	14.8	17.9	15.2	16.9
Haringey	29.4	28.4	25.4	20.7
Islington	16.5	18.1	16.3	16.0
Kensington and Chelsea	8.9	14.7	13.5	17.3
Lambeth	23.0	29.9	26.2	20.1
Lewisham	15.0	20.5	17.4	15.7
Newham	26.5	38.1	31.9	23.0
Southwark	16.2	22.0	19.1	16.3
Tower Hamlets	19.8	29.8	21.5	20.4
Wandsworth	18.4	20.9	18.8	18.8
Outer London	***11.7***	***15.3***	***12.9***	***10.8***
Barking and Dagenham	4.1	5.9	4.5	6.2
Barnet	12.6	16.3	13.7	12.1
Bexley	4.2	5.2	4.3	6.3
Brent	33.0	43.5	38.3	23.6
Bromley	3.6	4.2	3.7	6.2
Croydon	11.9	15.9	13.7	10.9
Ealing	25.0	31.7	27.5	18.8
Enfield	13.9	12.2	10.3	9.5
Greenwich	7.9	11.3	8.5	8.3
Harrow	15.2	21.9	17.4	13.6
Havering	2.4	2.9	2.2	5.3
Hillingdon	6.5	10.0	7.7	8.0
Hounslow	16.9	22.5	19.6	14.5
Kingston upon Thames	5.3	7.1	5.6	7.5
Merton	10.6	14.1	12.3	10.4
Redbridge	11.0	17.7	14.3	10.3
Richmond Upon Thames	4.5	5.0	4.3	7.3
Sutton	3.8	5.0	4.5	6.3
Waltham Forest	17.3	23.8	20.3	13.0

** persons living in households headed by a person born in the New Commonwealth and Pakistan*

Table 10 displays the overall average relationship between the three sets of estimates and the 1981 Census NCWP counts and percentages.

Table 10: Correlations between 1981 Census NCWP absolute counts and percentages and the LBS, SAR and LS 1981 estimates and percentages

Estimate	Inner London		Outer London	
	Absolute	*Percentages*	*Absolute*	*Percentages*
LBS Estimate	0.9333	0.8911	0.9878	0.9856
SAR Estimate	0.9491	0.9212	0.9894	0.9884
LS Estimate	0.9073	0.8359	0.9845	0.9868

The Pearson correlation coefficient was used to measure the relationship between the NCWP counts and percentages and the three estimation routines' corresponding data. The table indicates that for both counts and percentages, the relationship between 1981 NCWP data and the three sets of estimates is extremely high, over 0.9 for the majority of the correlations. In general, correlations for Outer London are higher than for Inner London. The SAR estimate produces the highest correlations for both absolute counts and percentages for Inner London and for Outer London. The LBS estimate also has a higher degree of correlation than the LS method for absolute counts and percentages in Inner London, and for absolute counts in Outer London. Overall, there is a higher degree of correlation between NCWP counts and estimate counts than for the corresponding percentage data.

Figures 5 and 6 below graphically represent the distribution of under- and overestimates produced by the three estimation routines when compared with the corresponding NCWP data for 1981 for Inner and Outer London. An examination of Figure 5 reveals that for Inner London the SAR and LS estimates were broadly correct i.e. within a margin of error of plus and minus 2.5 per cent of the NCWP Census figure for ethnic minority total, for around 15 per cent of the boroughs. The data also show that the LS estimation routine is more likely to produce an underestimate of the ethnic minority population than the LBS and SAR methods. However, in contrast the LBS and SAR methods are more likely to produce overestimates of this population than the LS routine. No estimation methods produced estimates for Inner London that were more than twice the NCWP Census figure, but both the SAR and LS methods produced ethnic minority estimates which were 25-100 per cent greater than the Census count for almost a quarter of the Inner London boroughs.

Figure 6 shows the corresponding information for Outer London boroughs. It is evident from this analysis that again the LS method is more likely to underestimate ethnic minority counts for Outer London boroughs than the LBS and SAR methods. In approximately 5 per cent of the boroughs, the LS method yielded an estimate that was broadly in line with the NCWP figure. The SAR method produced estimates for around 80 per cent of the Outer boroughs that were between 2.5 and 25 per cent greater than the Census figure, compared with just over 10 per cent for the LS method. The LBS method yielded results for almost 80 per cent of Outer boroughs that were 25 to 100 per cent greater than the NCWP figure. The SAR method was the least likely to produce results with this degree of error. The LS method was the only routine to generate estimates more than twice the NCWP figure, occurring in over 5 per cent of Outer boroughs.

Figure 5: Comparison of estimates against NCWP measure of ethnic minority groups for Inner London

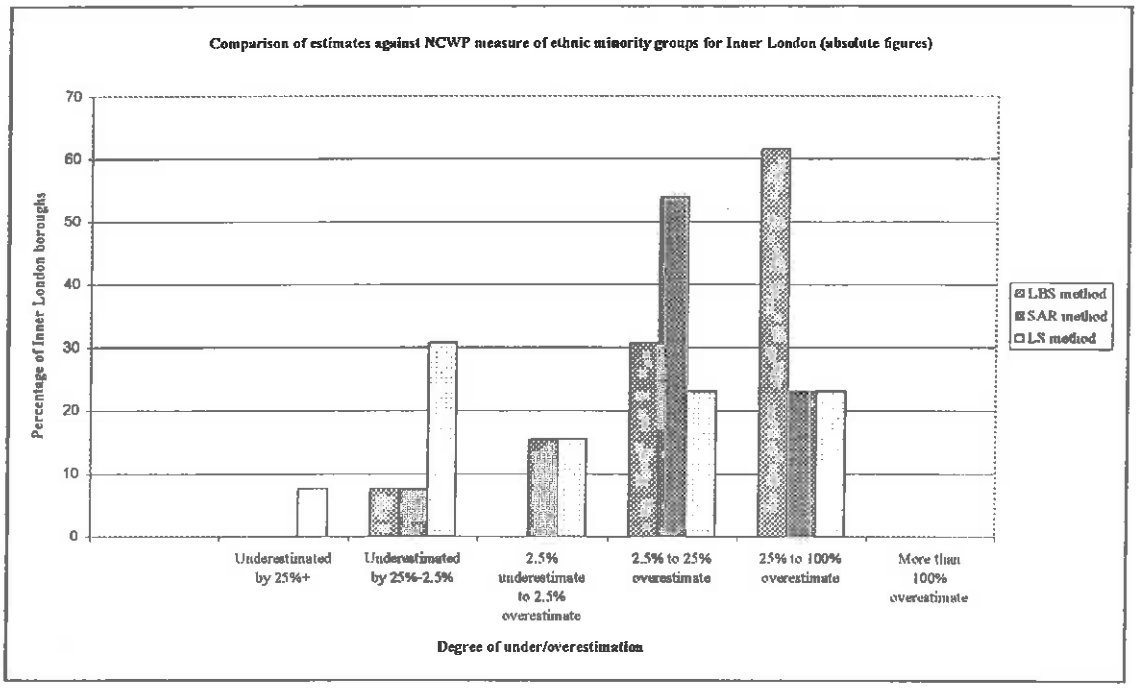
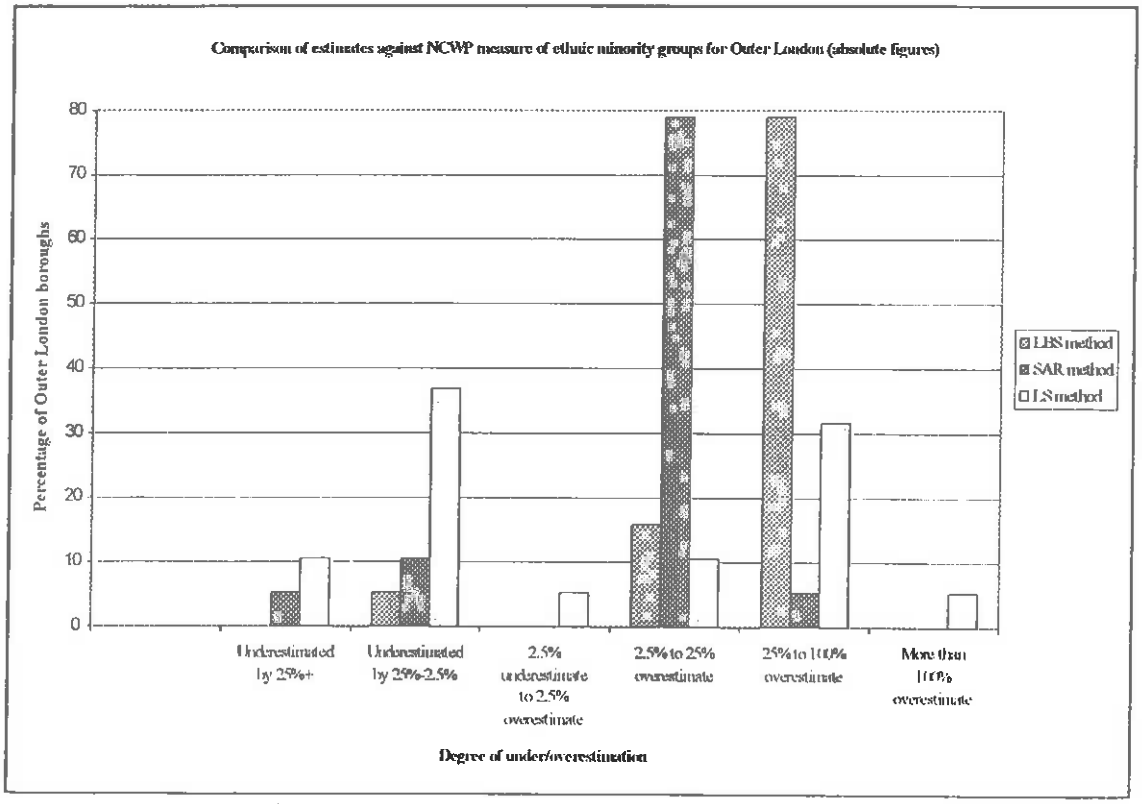


Figure 6: Comparison of estimates against NCWP measure of ethnic minority groups for Outer London



4.4 An evaluation: comparison of estimates with 1981 Longitudinal Study data

Although the 1981 NCWP data are useful in that they allows a comparison of ethnic minority population totals at the borough level, they do lack the detailed ethnic group breakdown provided in the 1991 Census and used in the estimation routines.

This detail is available, however, in the form of the Longitudinal Study. The LS and its linkage of 1991 to 1981 ethnicity allow the proportional comparison of this data set and the estimates produced for 1981. However, due to confidentiality constraints, ethnic group data are not available at the borough scale[1]. Therefore, any comparison of this data set and the corresponding ethnic group estimates generated by the three estimation routines must be limited to the Inner and Outer London scale. Thus, geographical detail is lost to ethnic group detail.

Table 11 below reports the percentage of the populations of Inner and Outer London at the time of the 1981 Census belonging to each of the ten ethnic groups used in the estimates.

Table 11: Comparison of 1981 LS and LBS and SAR estimates

	Percentage belonging to each ethnic group 1981									
	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO
Inner London										
LS	**81.4**	**7.2**	**1.6**	**1.2**	**3.3**	**0.9**	**1.0**	**0.8**	**1.2**	**1.4**
LBS Census Method Estimate	76.0	8.0	3.6	2.0	3.6	1.1	1.7	1.0	1.4	2.1
SAR Method Estimate	79.2	7.7	2.9	1.6	2.7	0.9	1.2	0.9	1.3	1.7
Outer London										
LS	**89.2**	**2.0**	**0.4**	**0.5**	**4.9**	**0.8**	**0.1**	**0.4**	**0.7**	**0.9**
LBS Census Method Estimate	84.7	2.7	1.1	0.8	6.0	1.3	0.2	0.6	1.2	1.4
SAR Method Estimate	87.1	2.5	0.9	0.5	5.0	1.0	0.2	0.5	1.1	1.1

An examination of the percentages shows that the LS reports a greater proportion of the White group than the LBS and SAR estimates and therefore a lower ethnic minority ratio. In Inner London the LS reports more conservative percentages for each of the ethnic groups except the Indian group for which the LBS and SAR estimates are lower. Again, the LBS estimates tend to be the more generous.

Turning to Outer London, the picture is slightly different. No LS ethnic minority estimates are greater than the LBS and SAR estimates, but for each of the Black-Other and the South-Asian groups, the percentages produced by the LS and the SAR are the same or very similar.

To summarise, it can be said that the SAR method compares favourably to the LS data, especially for Outer London.

However, there is an important caveat to bear in mind when using this linked 1981 LS data. As stated earlier, the 1981 LS ethnicity data will not include those persons who died in the 1981 to 1991 intercensal years. This will have a differing impact on each ethnic group. Different ethnic groups will be subject to different mortality rates, affecting the numbers who died between 1981 and 1991. Further investigation is required to assess the impact of this on the 1981 ethnic group data. However, a simple comparison of 1981 Census NCWP data and the corresponding LS ethnic minority data shown below in Table 12 shows that it is unlikely that this overall this will have a great impact on total ethnic minority totals, but may become more apparent for individual groups.

Table 12: Comparison of 1981 Census NCWP and 1981 LS ethnic minority data

	Percentage Ethnic Minorities	
	NCWP	LS
Inner London	17.9	18.6
Outer London	11.5	10.8

4.5 Results: ethnic groups' spatial change, 1981 to 1991

The following maps (14-43) display the absolute change in ethnic group size in the London boroughs over the period 1981 to 1991 as generated by the LBS, SAR and LS estimation routines. Table 13 shows the change in each ethnic group for each borough. A summary of change accompanies the maps and tables.

4.6 Summary of change

The White group

It is estimated that the White group experienced the greatest decrease in population of the ethnic groups. This is evident in maps 14, 15 and 16. The LBS estimate shows a central core of boroughs displaying increases in the White populations, which is not seen to such an extent in the SAR and LS estimated change. Both the LBS and SAR methods show the largest decreases to be found in the Outer London boroughs. The LS estimates are more generous in their estimates of change e.g. a loss of over 57,000 Whites in the intercensal decade for Brent. The estimates also show increases in boroughs other than those in the central core i.e. Bexley, Bromley, Sutton and Kingston.

The Black-Caribbean group

The Black-Caribbean group estimates of change show that the LBS and SAR estimates show a decrease in numbers in the Inner London boroughs. However, the LBS estimates report this change to be greater than that estimated by the SAR method. However, there is a general pattern among the Outer boroughs of increasing numbers, with the SAR estimates of increase greater than the corresponding LBS data. The LS estimates show a different spatial pattern of change. There is still the main central core of decreased Black-Caribbean population, although this is slightly different spatially, but decreases are far greater than the other estimation methods. The LS method also reports decreases in the peripheral Outer boroughs, most notably in the south-east, where increases have been otherwise estimated.

The Black African group

Each routine produces estimates that report increases in the number of Black-Africans for the vast majority of boroughs. The increases are generally centred on the Inner London boroughs. For this group, the estimates produced by the LBS method are more conservative than both the SAR and the LS method e.g. Southwark is reported to have experienced the greatest increase in Black-Africans of all estimates: LBS 1,759, LBS 3,812, LS 7,619.

The Black-Caribbean group

The LBS and SAR routines produce very similar patterns of change for the Black-Caribbean group. The maps show a loss of this population in the Inner boroughs, especially in Hackney and

Wandsworth. Brent is also estimated to experience a high degree of decrease. However, the vast majority of Outer boroughs are estimated to have experienced an increase. The pattern of change estimated by the LS shows a similar pattern, that of loss in the Inner boroughs, but magnitude of change is very different. The LBS estimates produce the most conservative change, and the LS the greatest.

The Black-Other group

The Black-Other group spatial patterns of change are very different for each estimate. The LBS estimates show little change has occurred over 1981 to 1991, the exception being a large decrease in Brent. The picture for the SAR estimation is very different. A core of central boroughs all show significant increases in population. This is mirrored to some extent in the LS estimated change, but in this case some Outer boroughs experience Black-Other population loss. The LBS estimates are the more conservative and the LS are the more generous.

The Indian group

The LBS and SAR estimates of change produce similar spatial patterns for the Indian group. The northern Outer boroughs show an increase in Indian population, the greatest increases being in Harrow and Redbridge. Inner boroughs experienced small increases or decreases. The LS estimates reproduce the pockets of increase in the north-west and north-east, but show decreases in the majority of boroughs. Again it is the case that the LS estimates of change are greater than the LBS and SAR corresponding data.

The Pakistani group

The patterns of change for the Pakistani group estimated by the three routines are broadly similar, with the larger increases in the population being found in Hounslow, Ealing and Brent to the north-west, and Waltham Forest, Redbridge and Newham to the north-east. The LS estimates differ in that Pakistani population loss is estimated in a band of boroughs from the central core to Bromley. Again, it is the LS estimates of change that are the largest, and the LBS estimates that are the smallest.

The Bangladeshi group

The three estimates of change are very similar in that each shows increases of Bangladeshi population in the central boroughs, focused on Tower Hamlets which is estimated to have experienced the greatest increase. In general, these increases among the Inner boroughs are far greater than those experienced in the Outer boroughs.

The Chinese group

The largest changes in the Chinese group population are estimated to have occurred in Southwark and the neighbouring boroughs by each routine. However, the patterns of population loss are dissimilar. The LBS estimates produce a smaller estimate of change than the SAR and the LS, the latter producing the largest.

The Other-Asian group

The Other-Asian population is estimated to have increased in the vast majority of London's boroughs over the intercensal decade by each of the estimation routines. The increases in each case are greatest in Newham, Ealing, Brent and Barnet. This pattern of increase is largely reproduced by each routine, the LBS estimates again being smaller than the SAR and LS corresponding change.

The Other-Other (Other non-Asian) group

The pattern of estimated change in the Other-Other group is very similar for the LBS, SAR and LS estimates. In each case, the largest increases are estimated to have occurred in the central Inner boroughs, and in the boroughs to the north-west of this area. Smallest changes are reported for the south-eastern peripheral boroughs of Bromley, Bexley and Havering, with the LS method estimating a decrease in Other-Other population in the latter borough. The LS estimation routine yielded the largest estimates of change.

Table 13: Estimated ethnic group population change, London Boroughs 1981-1991

Inner London	White			Black-Caribbean			Black-African			Black-Other		
	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS
City and Westminster	-5302	-8968	-6808	-1221	-640	-2940	266	-298	1273	-25	915	6
Camden	-1248	-4459	-940	-257	-173	-4205	451	996	1968	44	246	-13
Hackney	1460	-6350	-20120	-3387	-3830	2277	2545	4677	9456	-132	1478	523
Hammersmith and Fulham	4693	688	3280	-1392	533	-1503	453	1083	1717	52	232	100
Haringey	1803	-4504	-14090	-2129	-1717	2392	1759	3812	7620	-57	773	220
Islington	5205	2061	1653	-777	-608	-1587	659	1652	3763	112	983	128
Kensington and Chelsea	3673	2013	7388	-321	286	-2646	158	542	376	58	448	13
Lambeth	1597	-7636	-23020	-2514	-645	8498	2536	5862	11930	-2	2418	388
Lewisham	-299	-7534	-11576	-29	2156	5618	2279	3775	6248	16	2115	295
Newham	-4462	-17608	-36612	-1253	-681	1174	2878	5028	8157	-37	1267	89
Southwark	1265	-5008	-11194	-1635	-132	1886	5741	8021	13547	-8	675	227
Tower Hamlets	5997	-6129	-7682	-679	-350	-2219	840	1384	2443	141	707	9
Wandsworth	4615	-705	-902	-2441	-2400	-2873	-268	449	2556	-42	-95	129

Outer London	White			Black-Caribbean			Black-African			Black-Other		
	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS
Barking and Dagenham	-6289	-8416	-5905	199	806	31	219	566	610	-15	61	-1
Barnet	-2992	-10599	-15293	-13	235	-933	786	1792	4595	61	569	13
Bexley	903	-1090	3332	161	207	-941	111	74	441	25	393	-30
Brent	-6730	-19846	-57326	-4038	-3250	9910	876	2527	7877	-421	1359	414
Bromley	-4862	-6312	913	43	364	-1211	121	441	310	-5	227	-28
Croydon	-7172	-14287	-23275	838	1546	7377	694	1941	3763	-8	556	200
Ealing	-2145	-14083	-38633	-674	-132	4406	558	1183	2720	-46	659	166
Enfield	-3343	-8354	-10288	1004	2616	4112	830	1059	3363	28	400	114
Greenwich	-4958	-10824	-11351	100	1142	1555	904	1727	3398	-15	881	118
Harrow	-5351	-14328	-21770	287	950	1206	343	663	386	11	529	50
Havering	-10112	-11754	-4262	56	192	-1378	34	144	-70	1	183	-55
Hillingdon	-2095	-7667	-6909	290	1021	-576	179	50	118	66	124	-15
Hounslow	-253	-6099	-16482	-53	415	-581	286	302	1252	30	74	12
Kingston upon Thames	870	-1185	1375	31	-196	-987	72	267	84	22	270	-26
Merton	-147	-3156	-6444	347	672	1429	707	812	2761	28	537	70
Redbridge	-7211	-15027	-24172	667	1396	1954	481	1274	1657	3	379	57
Richmond Upon Thames	1601	497	5364	-3	-50	-1241	36	100	-115	0	26	-37
Sutton	-295	-1177	1984	93	-78	-906	95	197	215	26	257	-20
Waltham Forest	-3846	-11550	-27389	52	548	7444	852	1491	5328	-92	1490	257

Table 13 continued

Inner London	Indian			Pakistani			Bangladeshi		
	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS
City and Westminster	260	238	-1715	145	346	-84	1680	2340	2460
Camden	-136	-610	-2132	15	272	-368	3159	4336	4870
Hackney	-155	1188	-3	-41	710	240	1108	1817	1916
Hammersmith and Fulham	-118	220	-1665	-40	19	32	134	429	53
Haringey	-170	698	-440	99	318	86	1503	1843	1999
Islington	18	-361	-1814	44	144	-273	1207	1437	1723
Kensington and Chelsea	18	-260	-2256	55	-32	-149	136	217	34
Lambeth	140	-633	-3190	52	468	202	464	869	411
Lewisham	243	1243	-2377	53	-13	-412	196	-38	-249
Newham	1612	5953	14306	1422	3594	7664	4676	5989	7408
Southwark	376	755	-2351	11	293	-360	727	797	976
Tower Hamlets	-39	237	-1461	-27	31	16	15227	24617	29073
Wandsworth	-448	1134	-2038	3	961	1536	92	222	-203

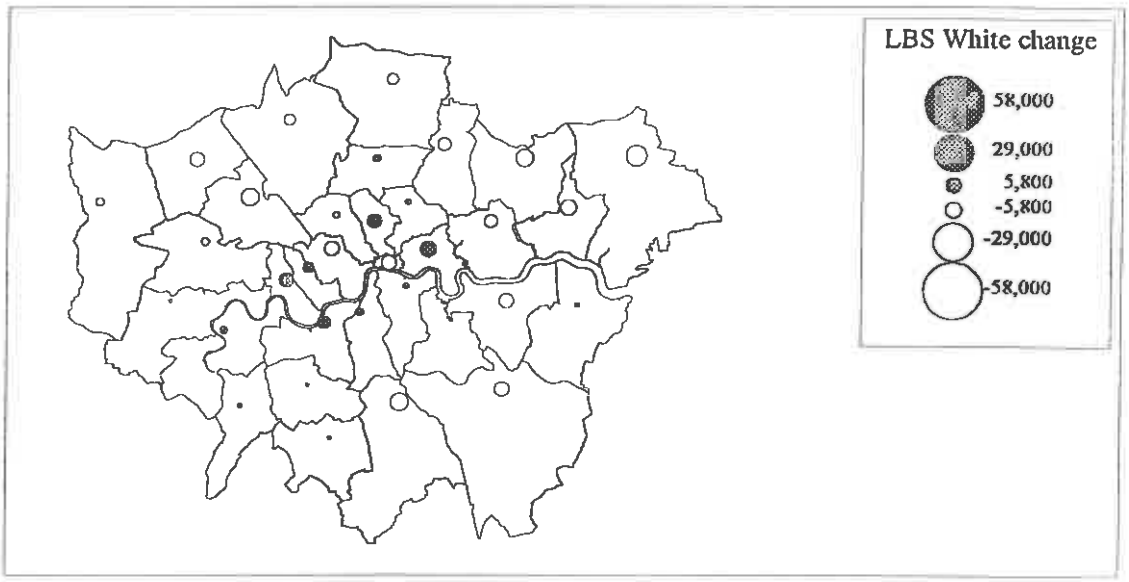
Outer London	Indian			Pakistani			Bangladeshi		
	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS
Barking and Dagenham	90	558	-804	51	218	594	80	152	112
Barnet	2611	5663	5096	355	657	318	455	531	812
Bexley	441	1230	-753	26	82	-614	74	130	137
Brent	1520	8243	15016	564	2538	3712	104	186	316
Bromley	249	610	-3883	33	63	-773	129	168	208
Croydon	1536	2968	-140	299	981	1080	236	573	473
Ealing	-1538	6309	16670	396	1287	3277	173	211	333
Enfield	1356	3016	241	119	467	-137	733	821	1490
Greenwich	371	1601	-457	122	701	39	133	193	235
Harrow	7020	12787	17631	331	933	754	112	302	284
Havering	129	374	-2454	0	185	-535	6	32	17
Hillingdon	3130	6178	7163	396	800	621	335	653	581
Hounslow	2611	6059	12983	767	1081	2663	205	403	387
Kingston upon Thames	317	988	-1025	111	222	173	35	113	43
Merton	724	1314	-1286	147	643	862	244	276	549
Redbridge	4368	8145	12524	1377	2441	4300	914	1225	1617
Richmond Upon Thames	91	536	-2107	27	177	-373	53	200	119
Sutton	370	781	-1523	88	275	-193	109	122	208
Waltham Forest	160	1457	-1983	783	3095	8653	807	1266	1379

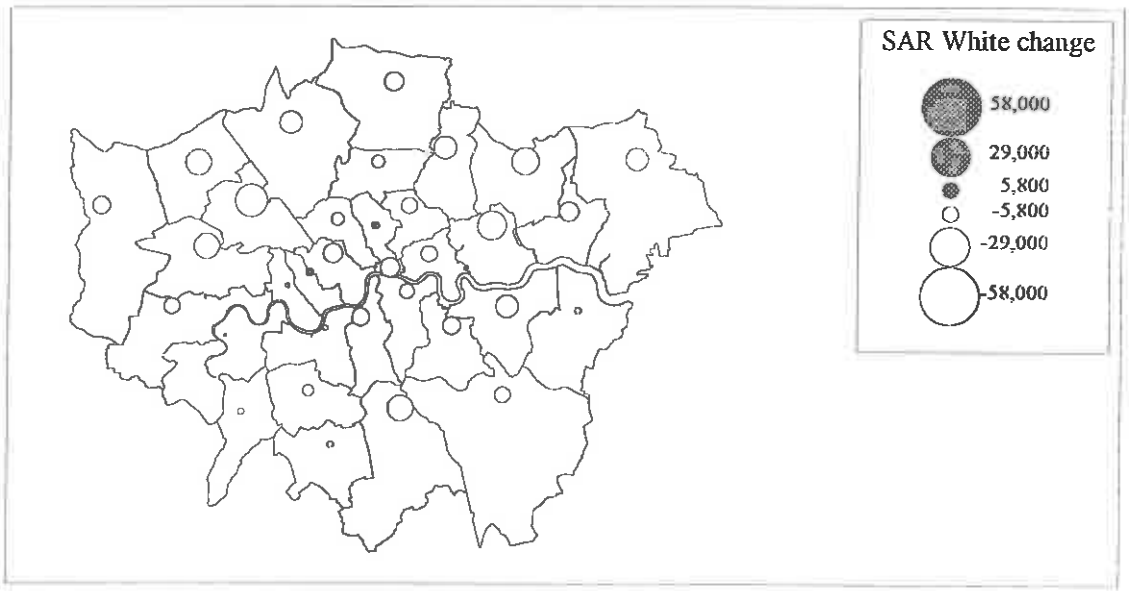
Table 13 continued

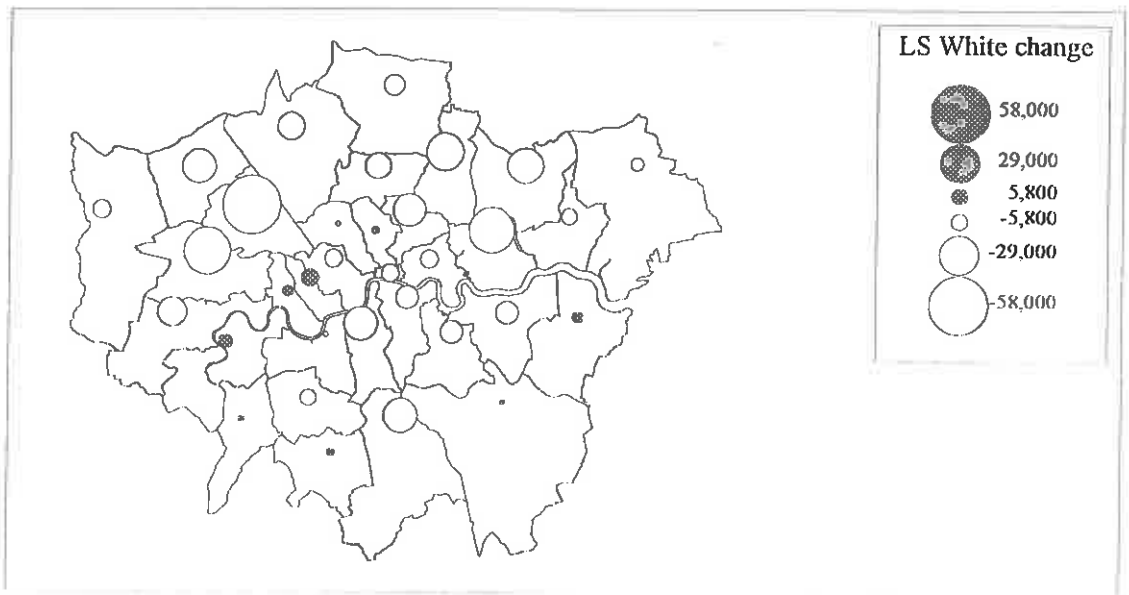
Inner London	Chinese			Other-Asian			Other-Other		
	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS
City and Westminster	-3	-388	-271	983	1597	1700	1412	3071	4526
Camden	-266	-44	210	550	1264	1185	380	879	2242
Hackney	340	601	741	555	530	390	514	1959	2659
Hammersmith and Fulham	175	82	-100	391	413	412	554	1200	1674
Haringey	274	84	694	689	964	1337	852	2319	2790
Islington	149	-18	743	336	886	421	469	1202	1487
Kensington and Chelsea	84	176	-710	643	786	794	707	1018	2234
Lambeth	480	887	1546	483	436	832	458	1709	2612
Lewisham	736	1350	1446	880	708	1645	369	643	1101
Newham	384	517	402	2755	3139	4957	438	1226	50
Southwark	1038	1266	1881	840	786	960	524	1437	1269
Tower Hamlets	465	1120	999	567	948	666	398	312	961
Wandsworth	385	812	453	1041	1572	2500	337	1347	970

Outer London	Chinese			Other-Asian			Other-Other		
	LBS	SAR	LS	LBS	SAR	LS	LBS	SAR	LS
Barking and Dagenham	89	165	238	126	254	-2	42	229	-270
Barnet	629	399	1666	2095	3439	5456	676	1986	2832
Bexley	204	576	685	237	497	325	115	156	-12
Brent	-271	95	543	2051	2015	5715	737	538	4490
Bromley	157	267	283	292	142	417	110	322	312
Croydon	237	-241	467	1100	2171	2867	322	1940	3475
Ealing	205	335	476	1593	1379	4765	1100	2467	3925
Enfield	112	538	206	819	590	364	460	920	1598
Greenwich	409	423	963	695	964	1333	221	1201	1088
Harrow	349	275	977	1276	2000	2925	415	651	1896
Havering	123	485	327	68	-33	-269	13	489	-524
Hillingdon	264	426	357	588	913	1387	379	994	902
Hounslow	233	313	306	784	1060	2345	562	1582	2188
Kingston upon Thames	220	200	459	1188	1468	2632	308	1043	696
Merton	282	520	498	1591	1421	3504	298	1172	1615
Redbridge	249	155	650	783	1289	1583	266	639	1206
Richmond Upon Thames	147	316	84	316	482	604	194	217	532
Sutton	143	188	244	485	558	1072	168	144	401
Waltham Forest	264	58	473	1006	1401	2090	215	955	1619

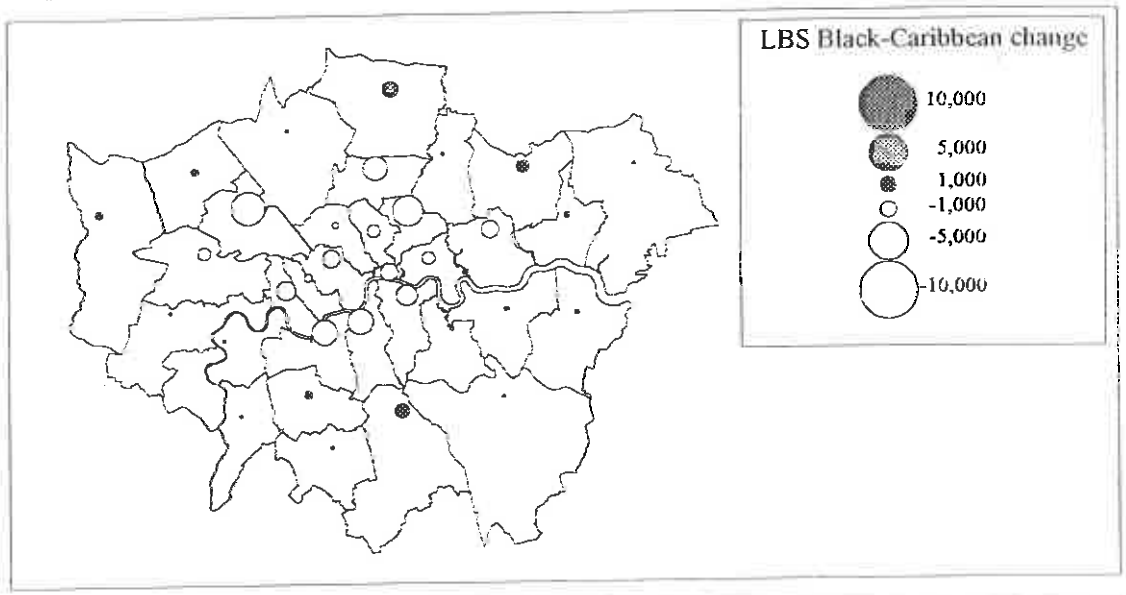
Maps 6a-6c: estimated White group change

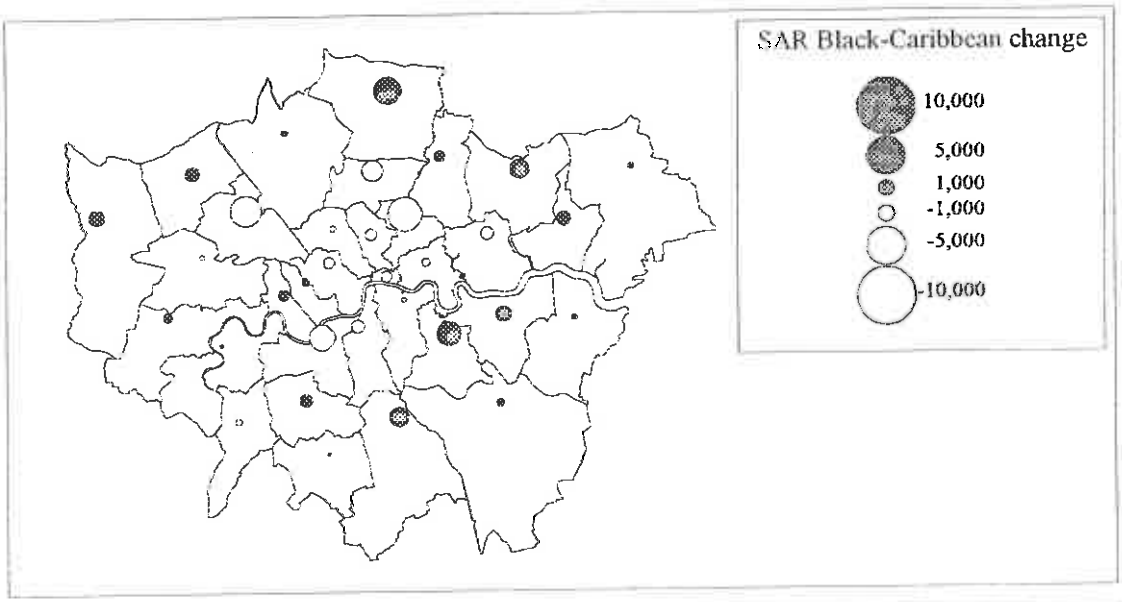


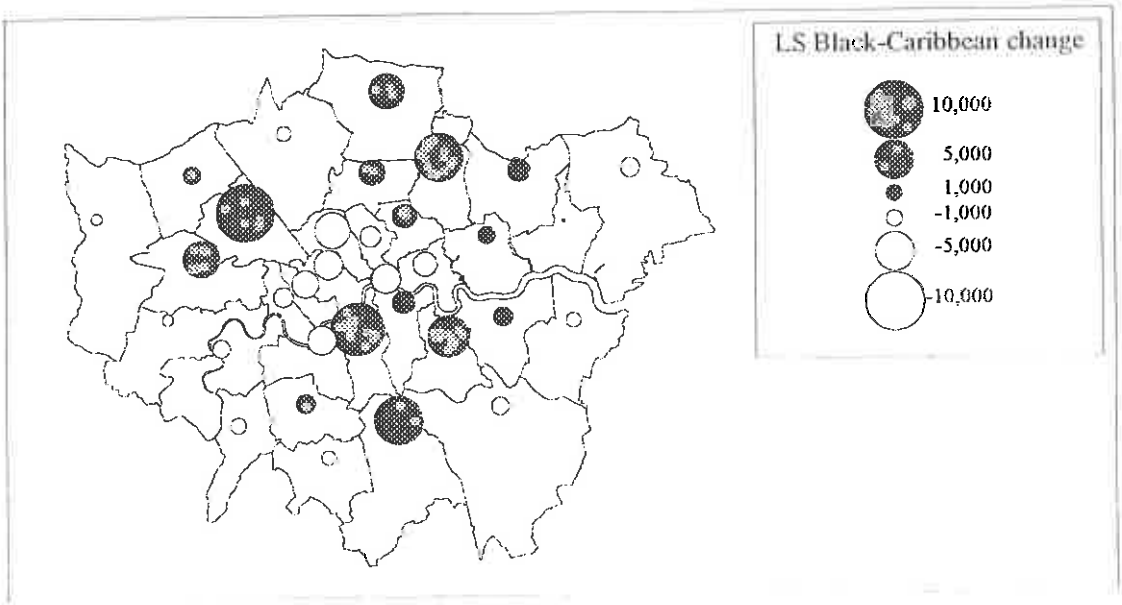




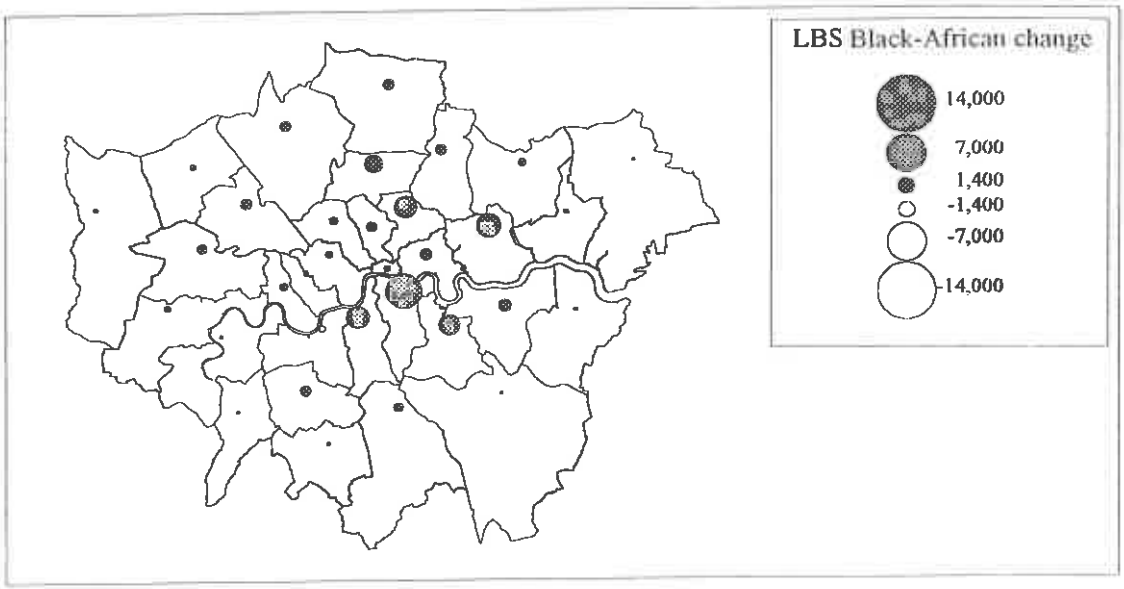
Maps 7a-7c: estimated Black-Caribbean group change

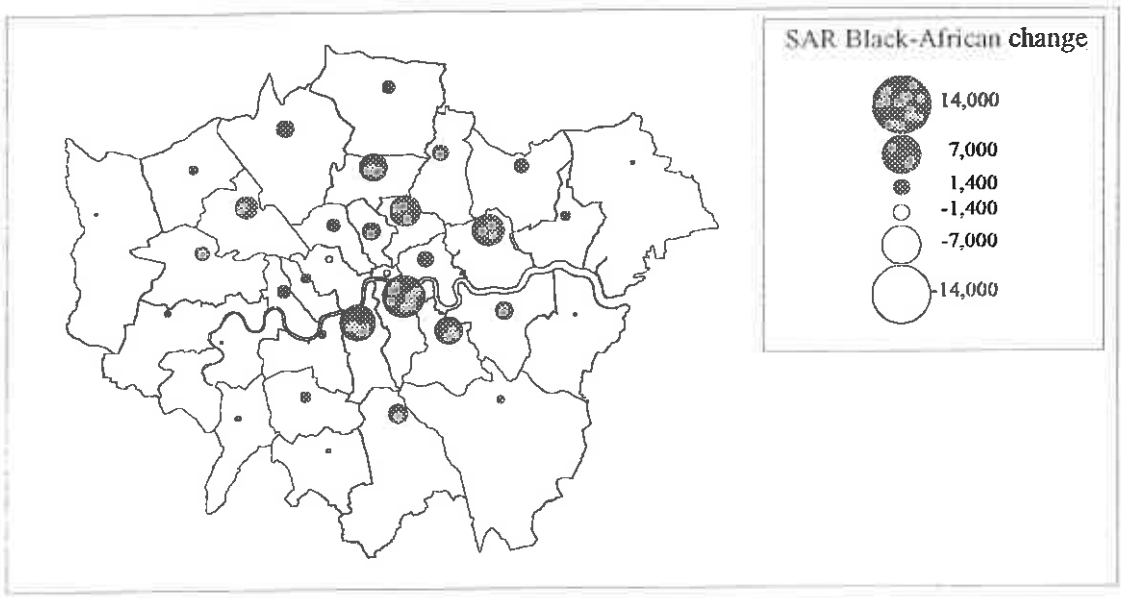


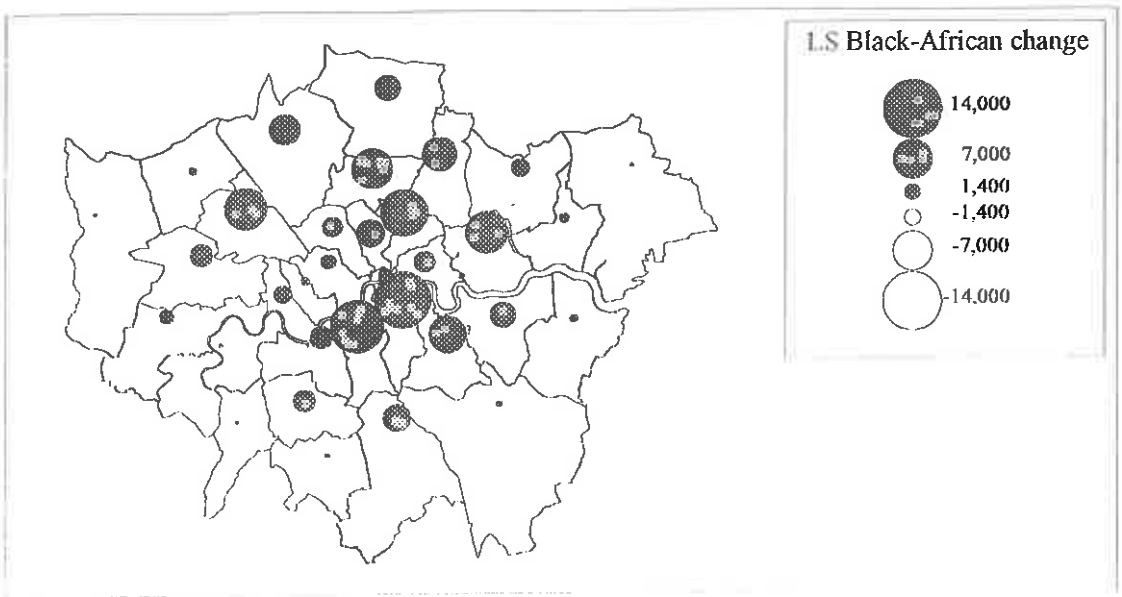




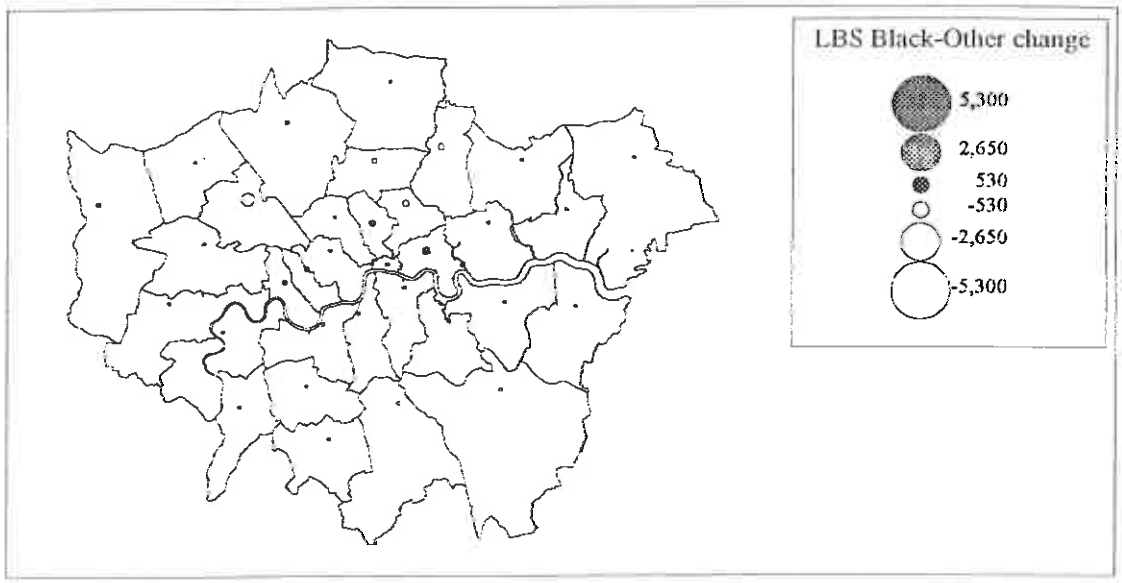
Maps 8a-8c: estimated Black-African group change

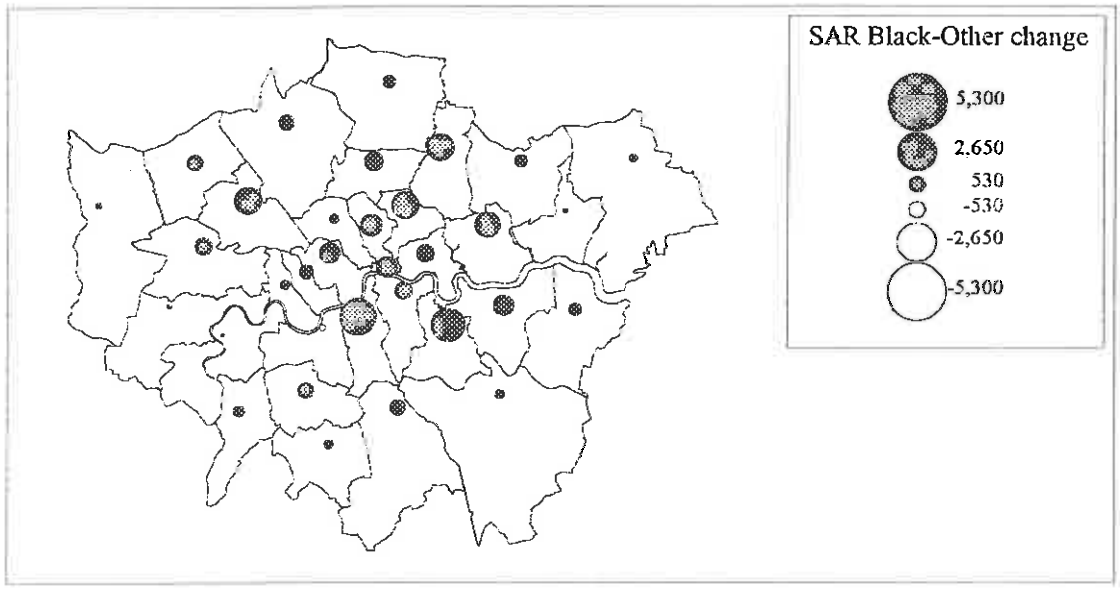


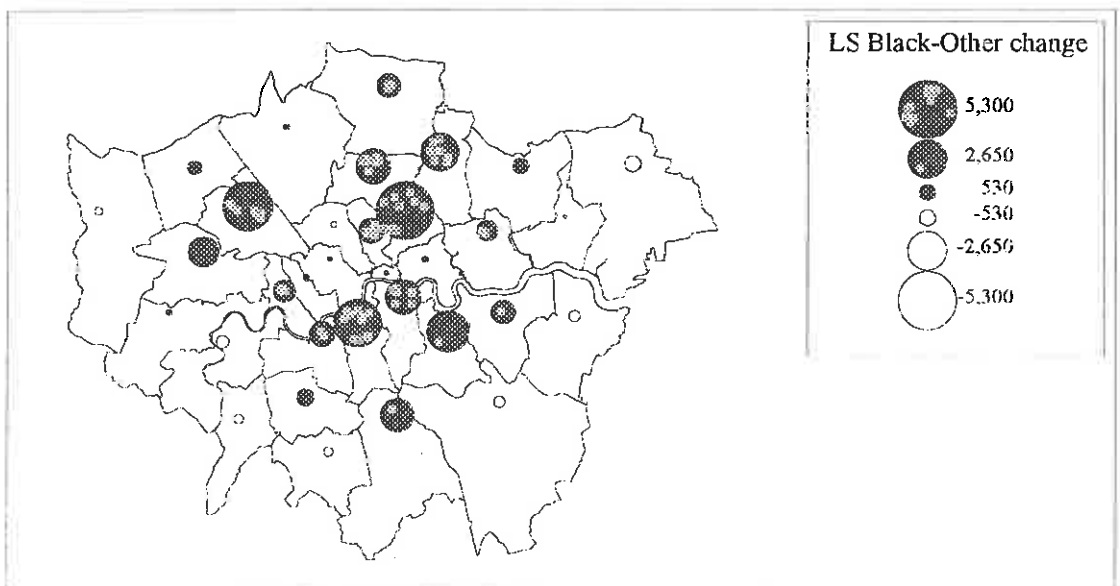




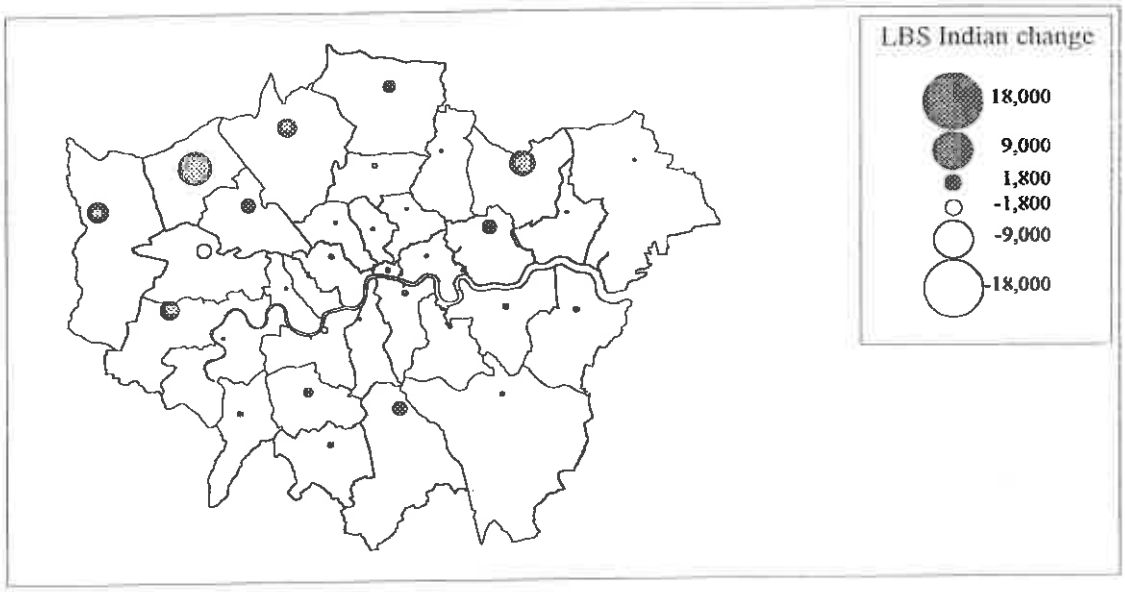
Maps 9a-9c: estimated Black-Other group change

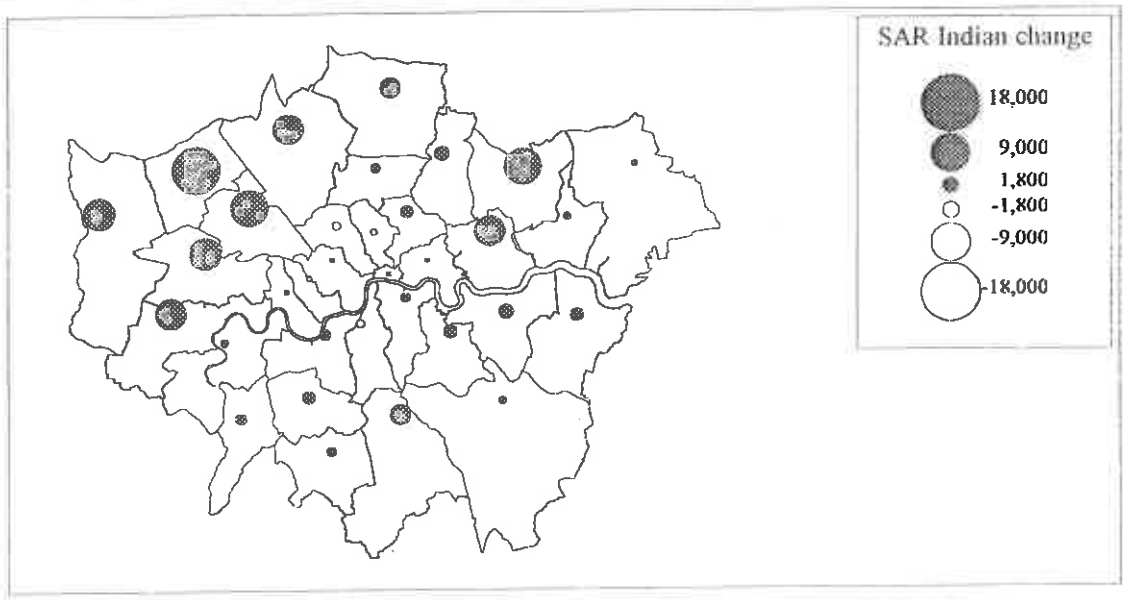


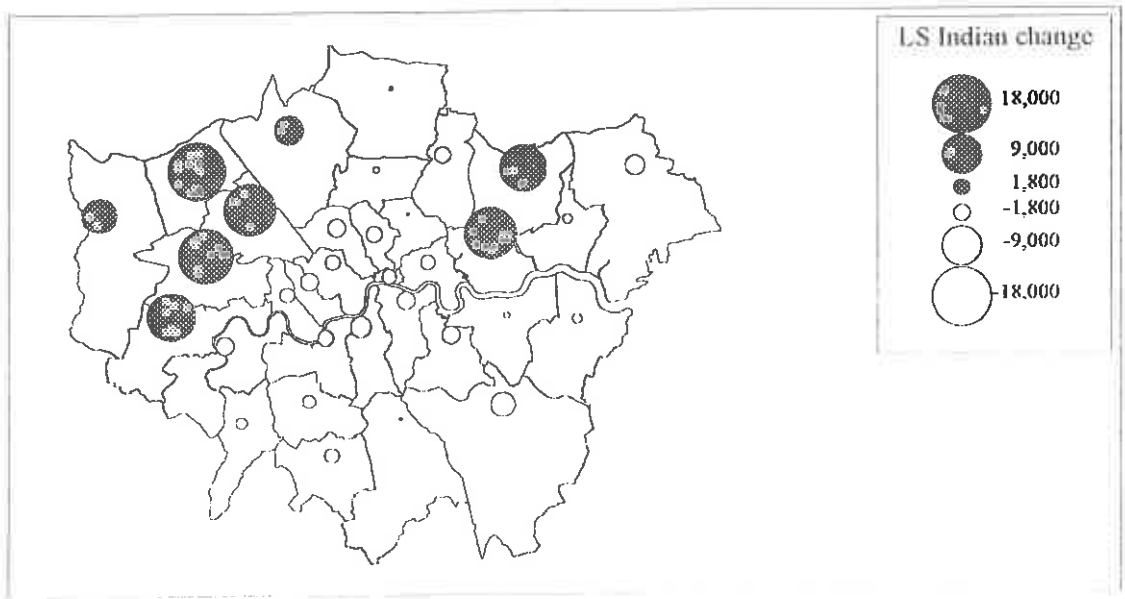




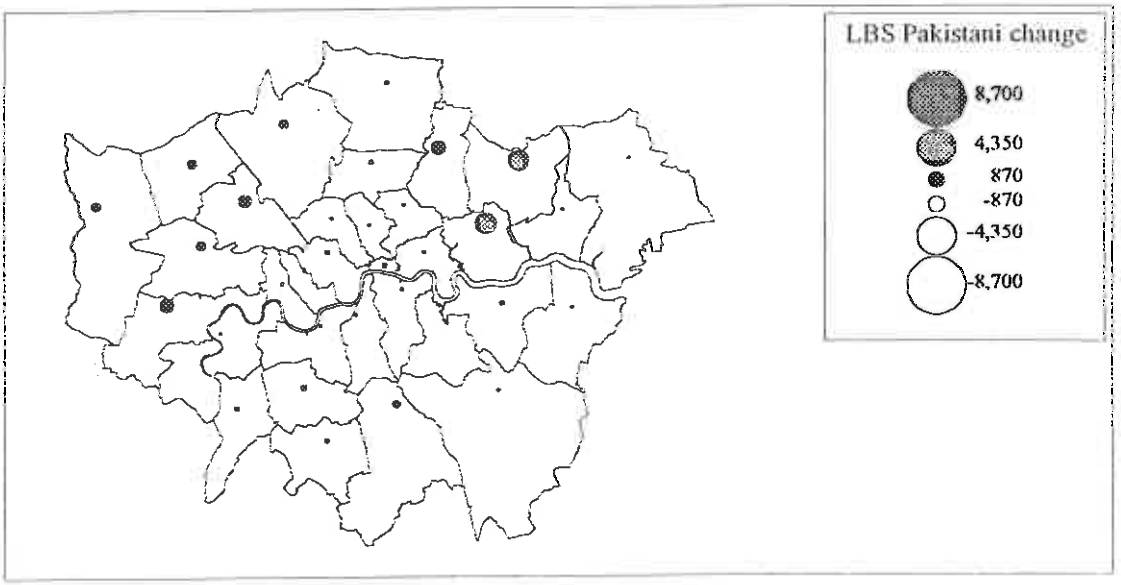
Maps 10a-10c: estimated Indian group change

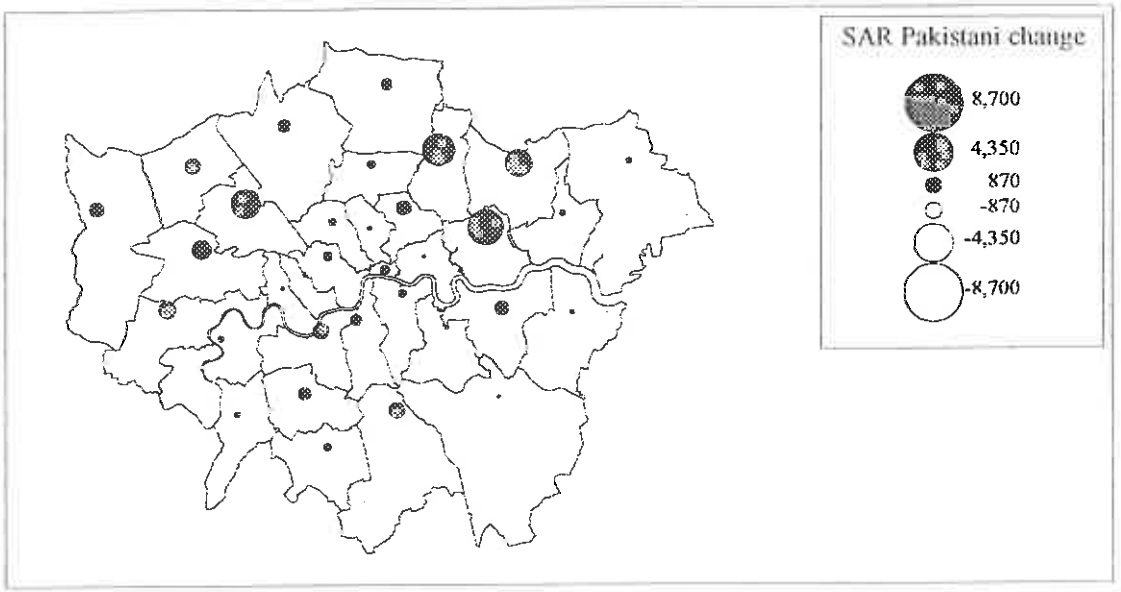


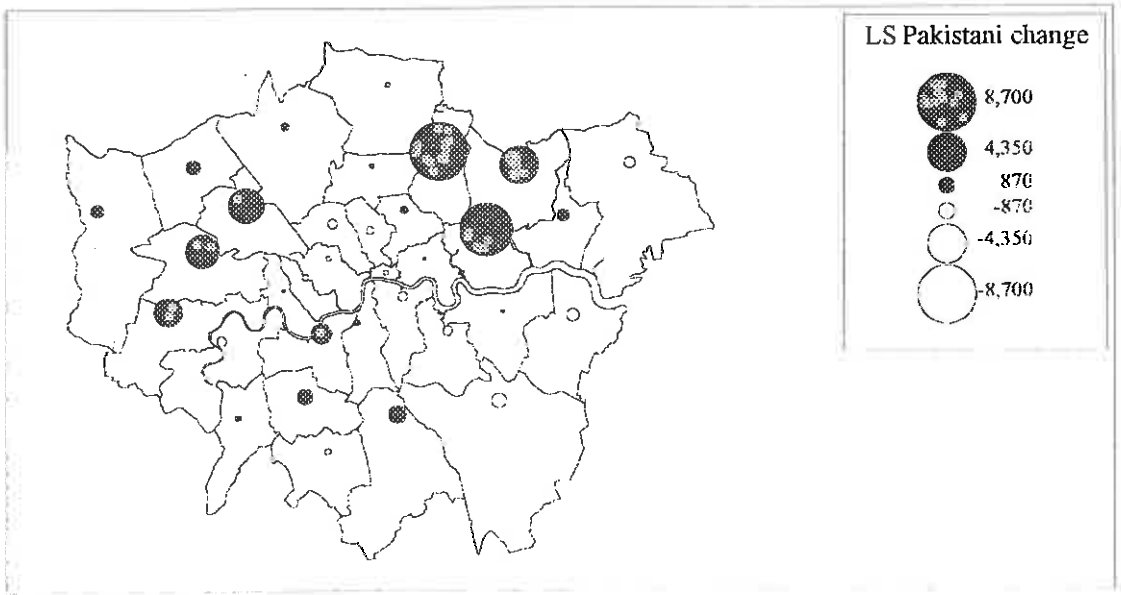




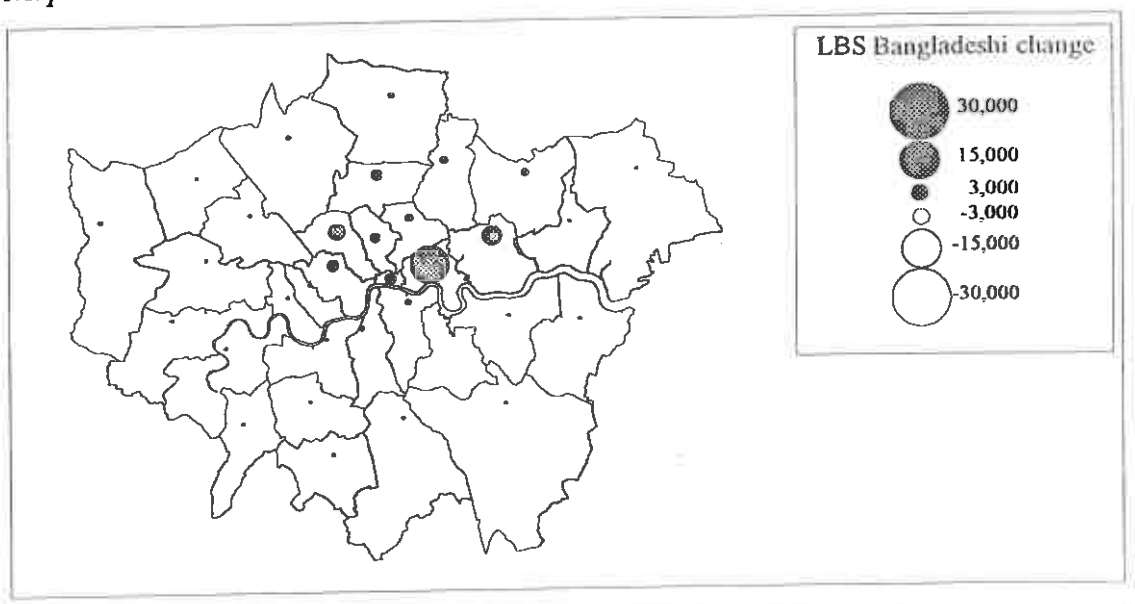
Maps 11a-11c: estimated Pakistani group change

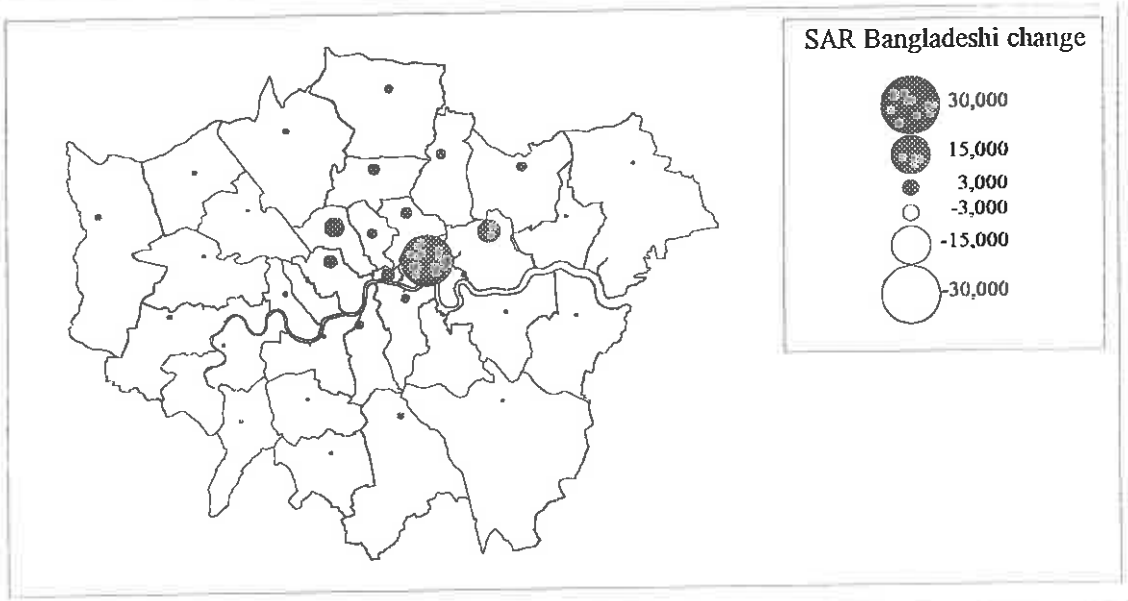


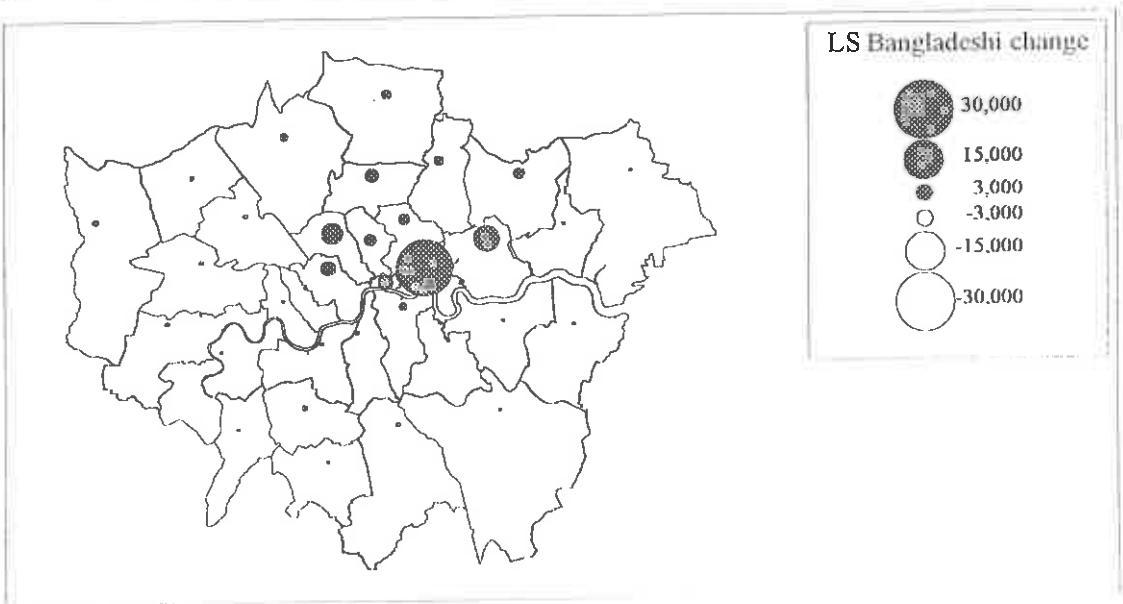




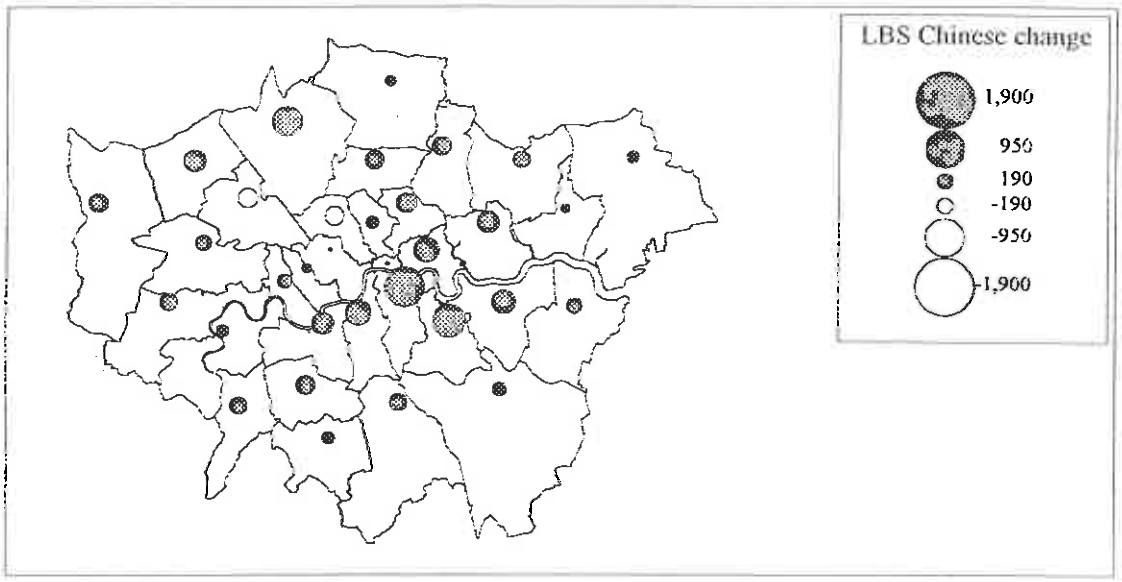
Maps 12a-12c: estimated Bangladeshi group change

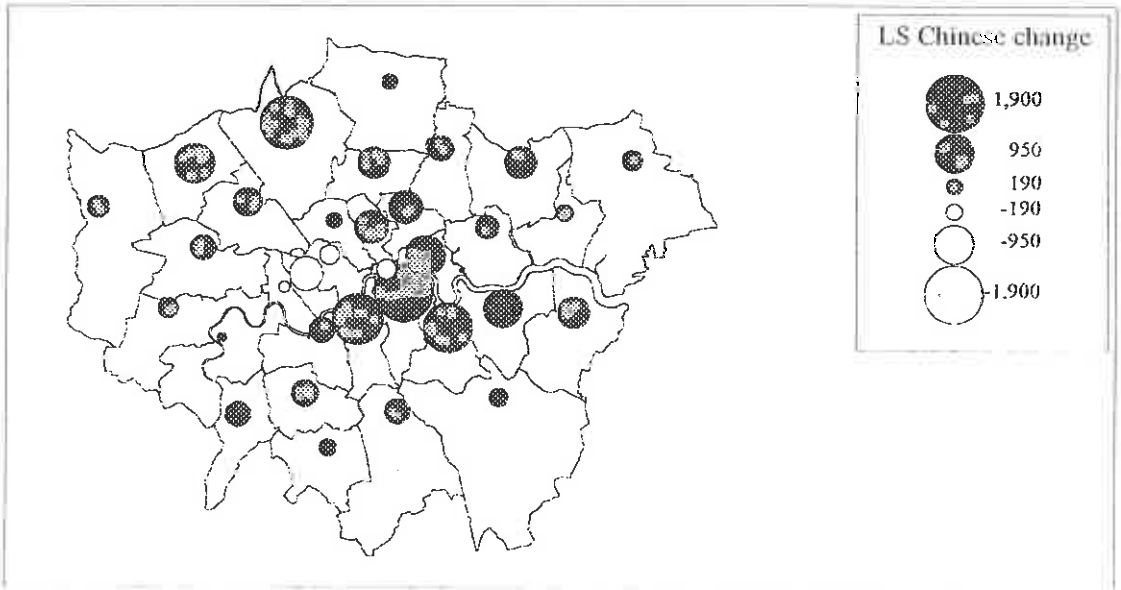




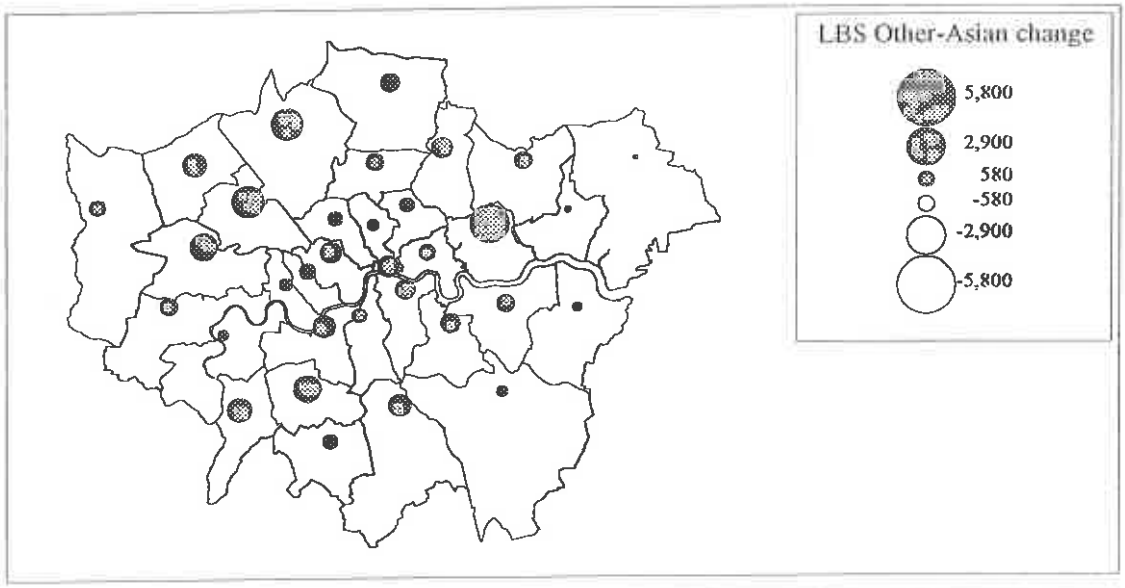


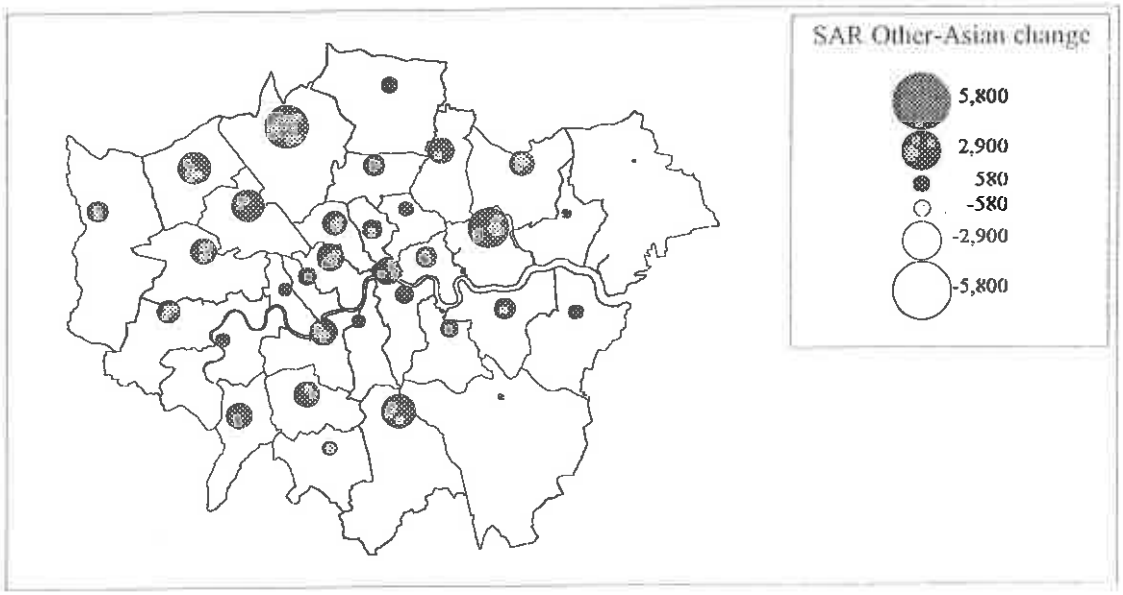
Maps 13a-13c: estimated Chinese group change

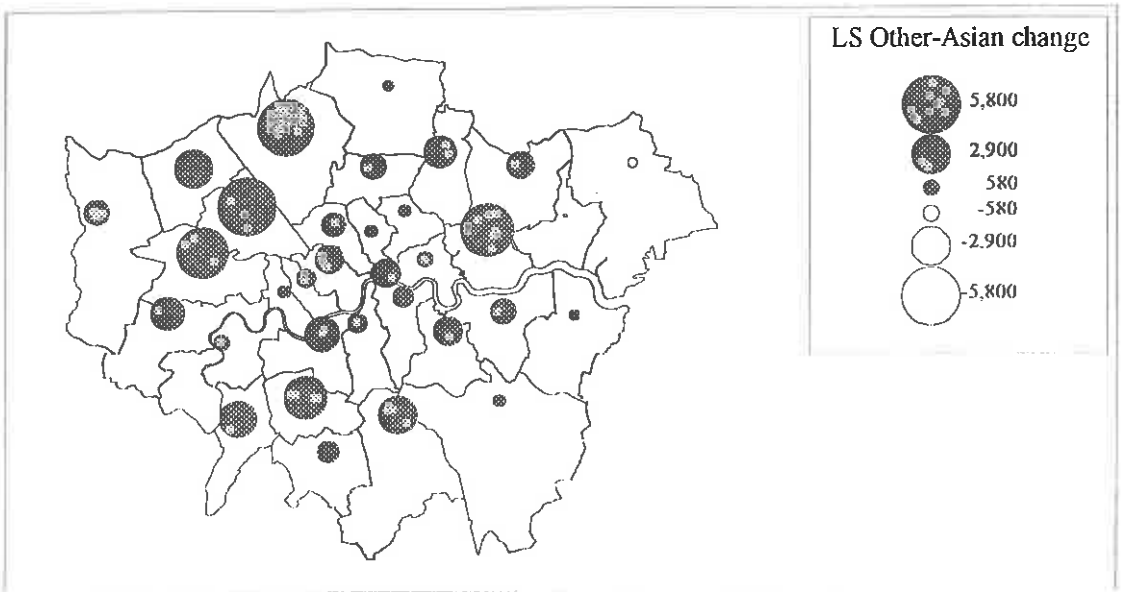




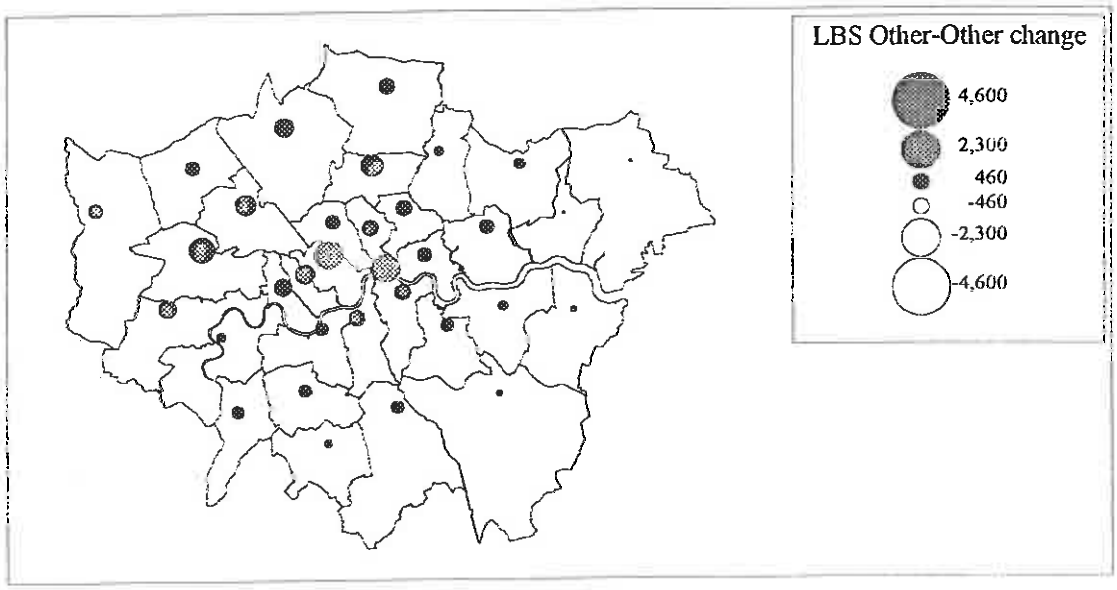
Maps 14a-14c: estimated Other-Asian group change

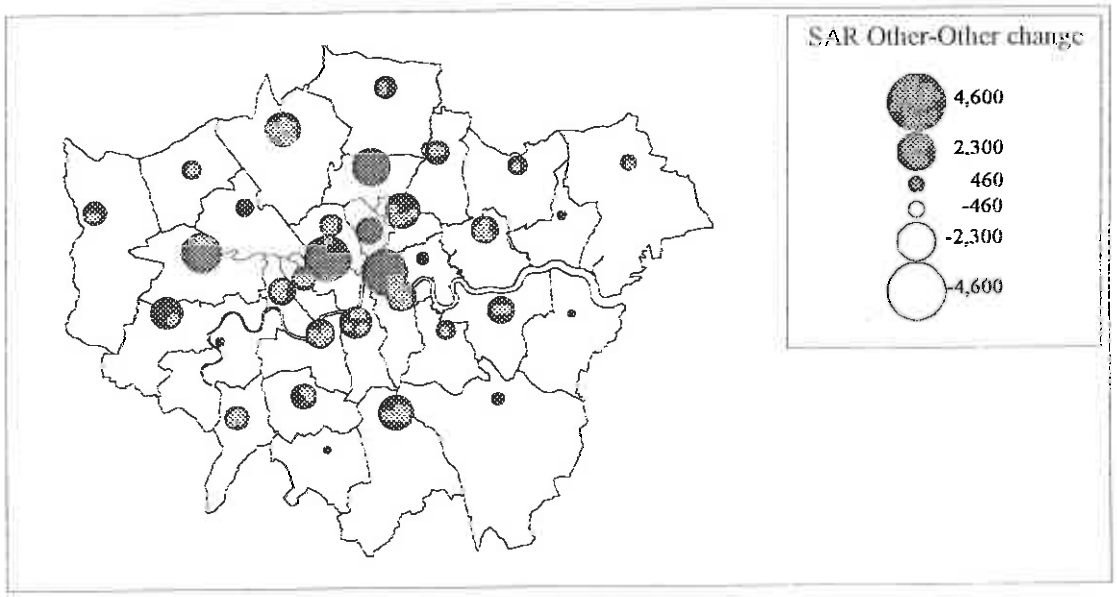


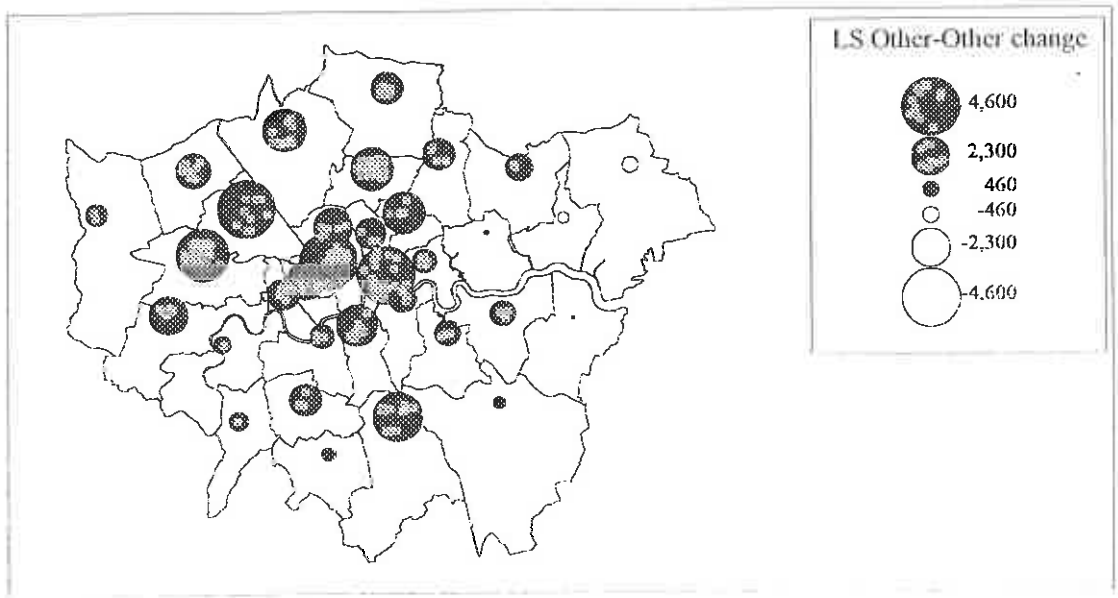




Maps 15a-15c: estimated Other-Other group change







5 CONCLUSION

5.1 Summary

This working paper has outlined the methodology and results of three estimation routines which compute 1981 ethnic group population counts for London Boroughs. It is evident that each of the LBS, SAR and LS methods of estimation has strengths and weaknesses, and it has been the aim of this paper to identify these factors.

The analyses have demonstrated that the three datasets generate three different effects on the estimates.

Age specificity/selection effects
Using the 1991 Census LBS in the computation of conditional probabilities for application to the 1981 SAS will produce a biased set of estimates. This is because the computation is performed with data including those aged 0 to 9 years in 1991, who did not exist in 1981 i.e. they were born in the decade after 1981. The advantage of employing the 1991 SAR or the 1981 LS is that the two samples allow the 0 to 9 year olds to be excluded, eliminating the age bias effects on the estimates. However, the 1981 LS is subject to another age bias as this linked records sample includes only those members who survived the intercensal decade and remained in England and Wales.

Time/location effects
The LBS and SAR datasets are problematic in the calculation of conditional probabilities to be applied to 1981 data. It is assumed that these 1991 conditional probabilities apply to the population in 1981. However, in reality it is the case that the population will have been subject to migration in the years 1981 to 1991 and that the conditional probabilities will therefore be false. However, this is not the case with the 1981 LS data, from which conditional probabilities for 1981 can be directly calculated.

Completeness of coverage/sampling effects
The coverage of the 1991 Census LBS is nearly 100 per cent, whereas the SAR and LS are 2 per cent and just over 1 per cent samples of the population respectively. The latter two datasets are reliable at the larger Inner London and Outer London spatial scale, but prove less reliable at the smaller Borough scale. For this smaller framework the LBS proves the most reliable dataset.

5.2 Work to do

The production of the preliminary results presented in this paper has informed the next stages of the estimation work, which are as follows:

i. undertake an analysis to establish whether the LS is a suitable substitute for the SAR in the estimation process;
ii. check whether borough level or borough group estimates can be obtained from the LS;
iii. re-weight the LS probabilities to allow for intercensal non-survivors i.e. deaths and emigrants;
iv. for geographical levels below reliable geographies estimate conditional probabilities using both LS and LBS data.

5.3 Results and anticipated outcomes

The 1991 Census shows that the ethnic minority population of Greater London was 1,326,673.

The three different methodologies estimate the corresponding 1981 figure to be 1,262,802 (LBS method), 1,078,810 (SAR method) and 931,099 (LS method). The 1981 to 1991 population change estimates range from 5 per cent to 42 per cent, highlighting the variability of estimates produced by the different methodologies.

Examination of the LS estimates reveal interesting patterns of change. The White group has lost population in the majority of boroughs, with the more substantial losses occurring in the Outer boroughs to the north. Growth of the Black-Caribbean population is marked in the Outer boroughs of Brent, Ealing, Enfield and Waltham Forest, with losses in many of the Inner London boroughs. This is in contrast to the Black-African and Black-Other groups whose increases have been centred around the Inner boroughs, especially Lambeth, Southwark and Hackney, with little change in the Outer boroughs. The Indian and Pakistani groups' estimates reveal very similar spatial change, although at different magnitudes, with increases in population found to the north-west and north-east, and losses in Inner London. It is Inner London, especially Tower Hamlets, that provides the focal point for Bangladeshi group increase. Other-Asian change has tended to have been concentrated to the north-east of the region, whereas the greatest change in the size of the Chinese group has been concentrated in Inner London, especially Southwark and Lambeth. The Other-Other group estimates show increases in the majority of boroughs, particularly those in the west of the region.

It has been stated that the results discussed are preliminary. Improvements need to be made to produce more reliable estimates. It is predicted that the improvements will have the following effects on the estimates:

i. higher conditional probabilities of belonging to the White group given UK birth;
ii. lower conditional probabilities of being non-White given non-UK birth;
iii. lower ethnic minority group estimates;
iv. more intercensal ethnic minority group change;
v. more geographical variety as finer scale information is built into the estimation routine.

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Appendix A: Full results

This appendix contains each full set of ethnic group estimates for 1981 London boroughs produced by:

i. The LBS estimation method
ii. The SAR estimation method
iii. The LS estimation method

Table 14: LBS ethnic group population estimates for London Boroughs, 1981

Inner London	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO	Total Ethnic Minorities
City and Westminster	157973	8341	4099	2166	3490	1106	2292	2938	4388	6814	193607
Camden	151085	3511	4089	1791	3088	774	3509	2898	3458	4801	179004
Hackney	123254	24606	10035	7718	6750	1876	2320	1665	2045	4817	185086
Hammersmith and Fulham	124255	10705	3362	2682	2582	1277	596	968	1604	3267	151298
Haringey	148350	21973	9813	4913	7814	1458	1717	2120	4135	4881	207174
Islington	135940	9539	5485	3173	2491	589	1629	2028	2081	3128	166083
Kensington and Chelsea	119513	3994	2655	1579	1677	805	472	1419	3358	4615	140087
Lambeth	177381	35045	14070	6968	5330	2056	1172	2728	2620	5540	252910
Lewisham	188041	24385	6575	6009	2669	723	458	1747	2294	3516	236417
Newham	131857	17199	9466	3547	27366	11683	3837	1410	3855	2669	212889
Southwark	170272	20671	10629	5090	2343	796	1542	1858	1812	3298	218311
Tower Hamlets	101923	6698	3031	1744	1757	1258	23987	1348	1284	2169	145199
Wandsworth	207311	18585	7887	4502	8595	4454	986	1795	3754	4155	262024

Outer London	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO	Total Ethnic Minorities
Barking and Dagenham	142646	1624	683	664	2739	1647	106	504	380	609	151602
Barnet	247224	3030	5364	1442	19719	2022	764	3378	6781	5503	295227
Bexley	205776	1321	820	613	4896	244	214	1021	934	1261	217100
Brent	143617	29544	9188	5889	41523	6965	651	2900	6856	7071	254204
Bromley	285823	2530	861	1015	2923	352	316	1024	1370	2214	298428
Croydon	270075	14842	4269	3489	13539	3192	574	1497	3775	5857	321109
Ealing	192613	13196	3739	3038	47205	7275	617	2316	5967	6271	282177
Enfield	229337	8647	3335	2406	7958	956	1443	1057	2734	3203	261076
Greenwich	191319	5192	3095	2155	6991	1171	259	1293	1713	2418	215606
Harrow	155460	4217	1342	1361	25998	2059	436	1492	3364	3274	199003
Havering	235224	1252	347	481	2341	374	177	708	389	882	242175
Hillingdon	209824	1860	603	776	12812	1661	591	930	1952	2250	233259
Hounslow	158138	2344	2010	998	27466	4604	415	1090	3185	3667	203917
Kingston upon Thames	124773	482	403	298	2879	786	116	906	2227	1445	134315
Merton	143944	4679	2669	1447	5164	2147	657	963	3102	2803	167575
Redbridge	188779	4981	1996	1596	19532	5125	1046	1314	2192	2735	229296
Richmond Upon Thames	153768	552	302	321	2595	330	278	738	1233	1714	161831
Sutton	161606	1068	524	506	2412	425	275	620	1397	1373	170116
Waltham Forest	165691	14813	5256	3732	7090	12966	1123	1003	2589	3226	217489

Table 15: SAR ethnic group population estimates for London Boroughs, 1981

Inner London	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO	Total Ethnic Minorities
City and Westminster	161639	7760	4663	1226	3512	905	1632	3323	3774	5155	193589
Camden	154296	3427	3544	1589	3562	517	2332	2676	2744	4302	178989
Hackney	131064	25049	7903	6108	5407	1125	1611	1404	2070	3372	185113
Hammersmith and Fulham	128260	8780	2732	2502	2244	1218	301	1061	1582	2621	151301
Haringey	154657	21561	7760	4083	6946	1239	1377	2310	3860	3414	207207
Islington	139084	9370	4492	2302	2870	489	1399	2195	1531	2395	166127
Kensington and Chelsea	121173	3387	2271	1189	1955	892	391	1327	3215	4304	140104
Lambeth	186614	33176	10744	4548	6103	1640	767	2321	2667	4298	252878
Lewisham	195276	22200	5079	3910	1669	789	692	1133	2466	3182	236396
Newham	145003	16627	7316	2243	23025	9511	2524	1277	3471	1881	212878
Southwark	176545	19168	8349	4407	1964	514	1472	1630	1866	2385	218300
Tower Hamlets	114049	6369	2487	1178	1481	1200	14597	693	903	2255	145212
Wandsworth	212631	18544	7170	4555	7013	3496	856	1368	3223	3145	262001

Outer London	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO	Total Ethnic Minorities
Barking and Dagenham	144773	1017	336	588	2271	1480	34	428	252	422	151601
Barnet	254831	2782	4358	934	16667	1720	688	3608	5437	4193	295218
Bexley	207769	1275	857	245	4107	188	158	649	674	1220	217142
Brent	156733	28756	7537	4109	34800	4991	569	2534	6892	7270	254191
Bromley	287273	2209	541	783	2562	322	277	914	1520	2002	298403
Croydon	277190	14134	3022	2925	12107	2510	237	1975	2704	4239	321043
Ealing	204551	12654	3114	2333	39358	6384	579	2186	6121	4904	282184
Enfield	234348	7035	3106	2034	6298	608	1355	631	2963	2743	261121
Greenwich	197185	4150	2272	1259	5761	592	199	1279	1444	1438	215579
Harrow	164437	3554	1022	843	20231	1457	246	1566	2640	3038	199034
Havering	236866	1116	237	299	2096	189	151	346	490	406	242196
Hillingdon	215396	1129	732	718	9764	1257	273	768	1627	1635	233299
Hounslow	163984	1876	1994	954	24018	4290	217	1010	2909	2647	203899
Kingston upon Thames	126828	709	208	50	2208	675	38	926	1947	710	134299
Merton	146953	4354	2564	938	4574	1651	625	725	3272	1929	167585
Redbridge	196595	4252	1203	1220	15755	4061	735	1408	1686	2362	229277
Richmond Upon Thames	154872	599	238	295	2150	180	131	569	1067	1691	161792
Sutton	162488	1239	422	275	2001	238	262	575	1234	1397	170131
Waltham Forest	173395	14317	4617	2150	5793	10654	664	1209	2194	2486	217479

Table 16: LS ethnic group population estimates for London Boroughs, 1981

Inner London	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO	Total Ethnic Minorities
City and Westminster	159479	10060	3092	2081	5465	1335	1512	3206	3671	3700	193601
Camden	150777	7459	2572	1971	5084	1157	1798	2422	2823	2939	179001
Hackney	144834	18942	3124	2350	6598	1595	1512	1264	2210	2672	185101
Hammersmith and Fulham	125668	10816	2098	1732	4129	1205	677	1243	1583	2147	151299
Haringey	164243	17452	3952	2650	8084	1471	1221	1700	3487	2943	207202
Islington	139492	10349	2381	1997	4323	906	1113	1434	1996	2110	166101
Kensington and Chelsea	115798	6319	2437	1505	3951	1009	574	2213	3207	3088	140101
Lambeth	201998	24033	4676	3083	8660	1906	1225	1662	2271	3386	252900
Lewisham	199318	18738	2606	3068	5289	1188	903	1037	1529	2724	236399
Newham	164007	14772	4187	2616	14672	5441	1105	1392	1653	3057	212901
Southwark	182731	17150	2823	2805	5070	1167	1293	1015	1692	2553	218300
Tower Hamlets	115602	8238	1428	1792	3179	1215	10141	814	1185	1606	145200
Wandsworth	212828	19017	5063	3164	10185	2921	1281	1727	2295	3522	262002

Outer London	Wh	BC	BA	BO	In	Pa	Ba	Ch	OA	OO	Total Ethnic Minorities
Barking and Dagenham	142262	1792	292	661	3633	1104	74	355	508	921	151609
Barnet	259525	3950	1555	1366	17234	2059	407	2341	3420	3347	295202
Bexley	203347	2423	490	941	6090	884	151	540	846	1388	217099
Brent	194213	15596	2187	1327	28027	3817	439	2086	3192	3318	254201
Bromley	280648	3784	672	1292	7055	1158	237	898	1245	2012	298402
Croydon	286178	8303	1200	1477	15215	2411	337	1267	2008	2704	321100
Ealing	229101	8116	1577	1332	28997	4394	457	2045	2735	3446	282201
Enfield	236282	5539	802	1287	9073	1212	686	963	3189	2065	261098
Greenwich	197712	3737	601	954	7819	1254	157	739	1075	1551	215600
Harrow	171879	3298	1299	867	15387	1636	264	864	1715	1793	199001
Havering	229374	2686	451	1041	4924	909	166	504	726	1419	242209
Hillingdon	214638	2726	664	995	8779	1436	345	837	1153	1727	233300
Hounslow	174367	2872	1044	901	17094	2708	233	1017	1624	2041	203901
Kingston upon Thames	124268	1500	391	580	4221	724	108	667	783	1057	134300
Merton	150241	3597	615	769	7174	1432	352	747	1189	1486	167601
Redbridge	205740	3694	820	1027	11376	2202	343	913	1392	1795	229302
Richmond Upon Thames	150005	1790	453	697	4793	730	212	801	945	1376	161802
Sutton	159327	2067	404	735	4305	706	176	519	729	1140	170099
Waltham Forest	189234	7421	780	1064	9233	5096	551	794	1505	1822	217499

[i] LS data for London Boroughs or Borough groups have been supplied to us and we are investigating the scale at which it can be used. However, availability at this spatial scale is probably restricted to London Boroughs and the large Metropolitan districts which have sufficient ethnic minority populations to make the release of ethnicity tables safe.