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"Sleepwalking towards Johannesburg"? Local measures of ethnic segregation between London's secondary schools, 2003 – 2008/9.

Richard Harris

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Centre for Market and Public Organisation
Bristol Institute of Public Affairs
University of Bristol
2 Priory Road
Bristol BS8 1TX
http://www.bristol.ac.uk/cmpo/

Tel: (0117) 33 10952
Fax: (0117) 33 10705
E-mail: cmpo-admin@bristol.ac.uk

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Richard Harris

CMPO, and School of Geographical Sciences, University of Bristol.

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Please note this is a draft chapter intended for publication in the forthcoming book 'Social-Spatial Segregation: Concepts, Processes and Outcomes' edited by C. Lloyd, I. Shuttleworth and D. Wong and published by Policy Press

Abstract

Because segregation is the spatial outcome of spatial processes it makes sense to measure it in spatially intelligent ways. To that end, this paper applies innovative methods of geocomputation with particular emphasis on local indices of ethnic segregation to examine the claim that London's schools are "sleepwalking towards Johannesburg." It does so by looking at the flows of pupils from primary to secondary schools, using them to analyse the spatial patterns that form in the distribution of ethnic groups between schools, and to determine the geographies of competition between schools. Those geographies are codified in the form of a spatial weights matrix to compare any school with its average competitor, giving a local index of segregation. The paper finds that although there is 'segregation' in the sense that the distribution of the ethnic groups differs from randomness, from a nearest school assignment and with some substantial differences between locally competing schools, the evidence, focusing on the Black African and Bangladeshi groups, is not that ethnic segregation is increasing but fluctuating with demographic changes over the period 2003 to 2008/9.

Keywords: ethnic segregation, London, secondary schools

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Address for correspondence
CMPO, Bristol Institute of Public Affairs
University of Bristol
2 Priory Road
Bristol BS8 1TX
rich.harris@bristol.ac.uk
www.bristol.ac.uk/cmpo/

"Sleepwalking towards Johannesburg"? Local measures of ethnic segregation between London's secondary schools, 2003 – 2008/9.

> [Headline:] Headteacher expresses alarm over racial segregation in London schools: "It can't be a good thing for London to be sleepwalking towards Johannesburg," conference warned […] with classrooms in some parts of the capital teaching almost exclusively black or Asian pupils (*The Guardian,* October 4, 2011, http://bit.ly/nsmyXy).

1. Introduction

The headline and text above appeared in the guardian.co.uk with another version appearing the following day in the print edition of it and other national newspapers. The report is of a presentation given by the vice-chair of the Headmasters' and Headmistresses' Conference (HMC, an association of 250 fee-charging schools) in which he voiced alarm at the way the capital was dividing into ghettoes and "becoming a silo society" (also suggesting that fee-charging schools might help offer a solution).

The language mimics, no doubt intentionally, that used by Trevor Philips in a speech given in September 2005 as Chair of the Commission for Racial Equality in which he stated the country is "sleepwalking into New-Orleans style racial segregation." Although Philips' speech was as much about residential communities as schools *per se*, it was linked to the debate about schools dividing on ethno-cultural lines following the civil disturbances in three English cities in 2001 (Cantle 2001; Ouseley 2001). Indeed,

Trevor Philips is himself quoted as saying on a national radio news programme in 2008 that "we all know schools are becoming more segregated than the areas they it in" (quoted by Finney & Simpson 2009, p.106)

Analysis by Johnston et al. (2006) revealed some of the divisions. Although about 75 per cent of the Black population were living in census neighbourhoods with a majority white population (in 2001), only 42 per cent of Black primary school pupils and 51 per cent of Black secondary pupils attended a school where the same was true. Similarly, though about 60 per cent of the South Asian population lived in white majority neighbourhoods, only 35 per cent of South Asian pupils were in white majority primary schools, and 46 per cent in white majority secondary schools. Overall the results of the study showed greater ethnic segregation in schools than in neighbourhoods, more so for primary schools than secondary schools, more so for Black and South Asian pupils, especially Pakistani ones, and generally more so in London than in other places.

The comparison of neighbourhoods with schools is not, however, exact. It is possible that the apparent post-residential sorting of different ethnic groups into different schools is explained by demographic trends leaving the 2001 Census population with a different composition to the school age population. A study by Harris & Johnston (2008) offered a more direct analysis, contrasting the ethnic profile of primary school intakes with the ethnic profile of pupils living in areas from which the schools could plausibly recruit students but do not necessarily do so. It also compared the profile of each school with those of other schools recruiting locally from the same areas. In both London and Birmingham the study found clear examples of where the intake of a school had an ethnic profile very different from the places from which the

pupils were drawn, and from other nearby schools. For example, it found a Community school in Birmingham where the percentage of Pakistani pupils was expected to be 38.1 per cent, was actually 12.5 per cent, and where its most immediate 'competitor' was recruiting no Pakistani pupils at all. This and other examples gave evidence of what might be regarded as ethnic polarisation occurring locally between schools.

However, to find examples of apparent segregation (or polarisation) is not to show it is the norm or that it is increasing in the way the dynamic of "sleepwalking" implies. In a cohort analysis of pupils entering English primary and secondary schools in each of the years 1997 to 2003, Johnston et al. (2007) find, with one exception, that "levels of segregation remain as they were – considerable but not growing" (p. 88), with any apparent increase in segregation explained by an increase in the non-white groups' share of the entry cohort in each local authority. The exception is relevant: Black Africans in London's secondary schools, one of the groups about which the headteacher quoted at the beginning of this paper is concerned.

The paper proceeds as follows. First a review of what is meant by segregation is given emphasising that it is "the spatial separation of groups within a region" (Rey & Folch 2011, p.432). However, this is a loose definition (as those authors would agree). In practice, measures of segregation encounter both a theoretical challenge (how actually to conceive segregation) and, of special interest here, a geographical challenge; specifically, the modifiable areal unit problem (MAUP): how to define and to make measurements based on geographically meaningful comparisons of geographically meaningful places. However, rather than see the MAUP as a problem, with the availability of suitable micro-data and a more geocomputational approach to analysis so

it is possible to dispense with measures of segregation over arbitrary regions and move to an approach that better suits the context of the analysis.

Here the context is educational research and whether ethnic segregation has grown in London's secondary schools from the academic year 2003/4 to the year 2008/9. The opportunity is to form measures of segregation that look at the differences between school compositions in regard to the local patterns of admissions and the local competition for pupils and places.

2. Segregation, measurement and the modifiable area unit problem

Broadly defined, segregation is the separation of one or more groups of people that have, or are given, characteristics that they or others imbue with particular meaning (for instance, race, religion, gender, wealth, age, social class). The separations are place-bound, by residential neighbourhood or by institutions such as schools or workplaces. The implication is that people who might otherwise be coming together and interacting are not doing so, a situation that is genuinely assumed to create distrust, a lack of mutual empathy, misunderstanding and/or to hinder life chances and social mobility.

The (presumed) lack of mixing could be directly enforced – most perniciously by apartheid – or, more probably, due to complex and multiple processes of selection and exclusion, including the workings of the housing and employment markets, the geographies of public sector provision such as housing, the consequence of social attitudes and behaviours, the legacy of past or present immigration policies, and so forth. Segregation can be voluntary, at least in part – an action that is to some degree

self-determined, such as choosing a residential neighbourhood or school where one's own cultural group is not in a minority – or it could arise as a forced response to the lack of other options available. It is usually treated pejoratively, a stain on society that reveals prejudice or inequality of opportunity, though living or being with one's peers or kin can also have positive supporting effects, strengthening a sense of identity and inspiring confidence (which might be important for learning: Weekes-Bernard 2007).

Despite the complexity of what actually is meant by segregation and whether it is necessarily a bad thing (and if so, for whom, and why), what can be agreed is that segregation is a spatial and comparative phrase. The word means a person of a particular group is more likely to be found in one place more than others. This inequality can be described and conceived in various ways including as unevenness, isolation, clustering and as a lack of exposure to other groups (Massey & Denton 1988). Differing conceptions lead to different forms of measurements, different forms of segregation index (Johnston & Jones 2010). However, in all cases there is an expectation that if places are compared then differences in their composition will be found. To measure segregation is to measure the spatial separation of groups within a region (Rey & Folch 2011).

As Rey and Folch note, all segregation measures are in principle spatial, though not necessarily in the spatial statistical sense (most ignore the specific locations and interdependencies of the schools or neighbourhoods being analysed and simply consider them jointly within a wider region). They measure differences between places. Consequently they encounter a general measurement issue, that of the well-known modifiable areal unit problem (MAUP).

The MAUP has two components. The first is the zoning problem. Segregation is marked by a greater density/concentration/prevalence of a particular group in some places more than others but any measure of it depends upon where the boundaries of the places are drawn. Some have more obvious and fixed boundaries (schools, for example) but others have either indeterminate and subjective boundaries (such as communities) or somewhat arbitrary boundaries imposed for governmental or administrative purposes (e.g. electoral wards and census tracts) (Martin 1998).

The second component is one of scale dependency. Any measure of density is inherently dependent on the area or population size of the place for which the measurement is made. In the context of segregation indices there is a twofold problem: deciding on the choice of areal unit (e.g. schools, census tracts or districts) and then deciding which places should be compared with which others across or within a wider region (for example, local education authorities or governmental regions). It is common for measures of segregation to sum across a region such as a local or regional authority with the implicit assumption that these provide the units that best capture the spatial extent and boundaries of the segregation-forming processes and their resultant patterns. The assumption is often questionable precisely because the group of interest has an uneven geographical distribution, because it is segregated within the region.

Consider a minority group that is concentrated only in a small part of a local authority. Looking at differences across the entire region does not make a tremendous amount of sense: in most or many places there is little or no difference to detect so those that do exist are averaged away or, at least, understated. But being too myopic doesn't help either. Consider a chess or checkers board. There is no segregation within a

single square, the colour is uniformly distributed. It is only with the wider view when the boundary between two squares is considered that the separation of black from white is seen. (If we pull back further and consider the whole board we could conclude that the two colours are, in fact, perfectly mixed).

However, rather than regarding the MAUP as a problem it can also be conceived as an opportunity (a way of thinking that has its lineage from the work of Professor Stan Openshaw). The opportunity is not to fix the scale of the analysis in advance but to calibrate it to the study and data at hand. This is important for educational research determining patterns and trends of social and ethnic segregation between schools. In the UK, such research has focused on a wave of education reforms from the 1988 Education Act onwards that have sought to promote school choice to parents, to provide attainment data and school inspection reports as information to guide that choice, to allow (within the limits of the national curriculum) greater subject or vocational specialisation, to encourage charitable, private-sector and cross-school partnerships, and, by linking funding to the number of pupils on the school roll, to introduce marketisation and competition within the sector.

To ask whether segregation is increasing or decreasing, perhaps as a result of the reforms (direct causation is exceptionally tricky to establish), empirical evidence is sought, most often at the local authority scale. The problem is that local authorities vary greatly in size: in area, population count, and the number and types of school they contain. They are not standardised units designed for comparative studies. In addition, there is no particular reason to assume that their boundaries are congruous to the geographies over which schools 'compete' (in the general sense of sharing admission

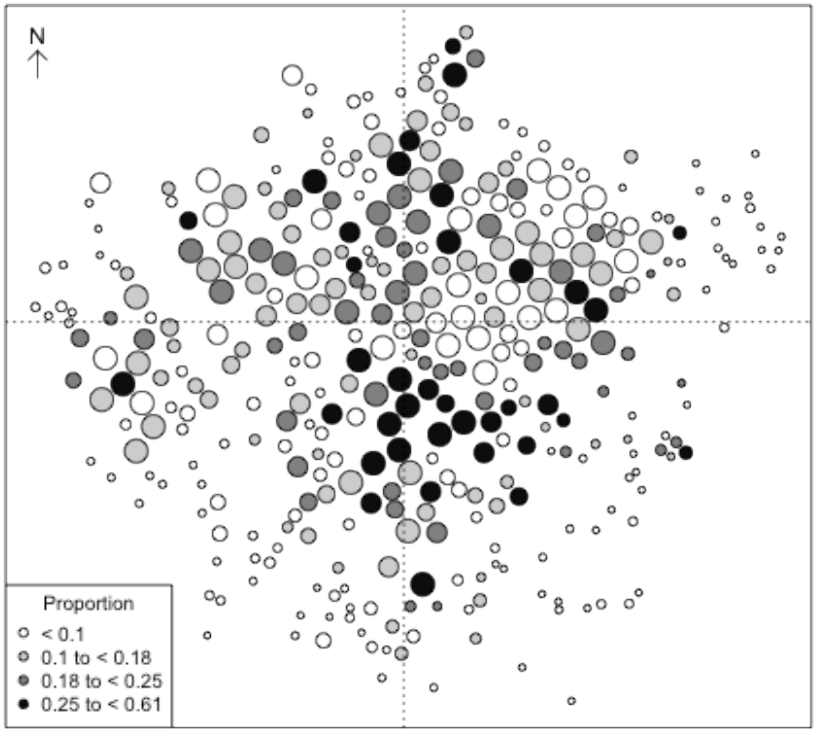
spaces) or which parents and pupils make their school choices. To compare the composition of a school in one corner of an authority with another in an opposite corner some miles away makes little sense if they have little in common other than they happen to be within the same yet somewhat arbitrary boundaries of the local authority. An alternative comparison is to compare each school with its local competitors, including those across local authority borders since parents are open to apply to those schools too.

Before considering this local perspective further, the scene is first set by considering the spatial distribution of various ethnic groups across London's state-supported secondary schools.

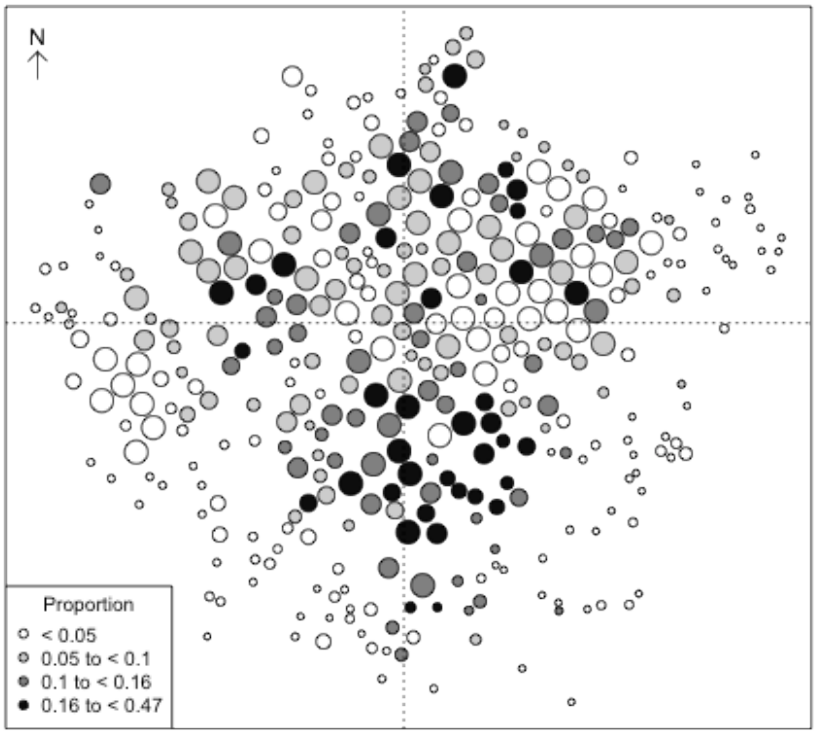
3. Geographies of ethnicity for London's secondary schools

Figure 1 maps the prevalence of various ethnic groups in London's secondary schools according to their proportion of new entrants to the schools in September 2008 (the proportion of the pupils entering year 1 of those secondary schools in the academic year 2008/9). The maps are cartograms where the size of the symbol is relative to the proportion of 'not White British' pupils per school, except for the map of White British pupils where it is relative to the proportion of that group. The use of random data swapping between nearby schools preserves the overall geography but means the true values for specific schools should not be presumed from their locations on the maps. The class breaks are at the 50th, 75th, 90th and 95th percentiles of the distribution, a non-linear scale to highlight the schools where a group is most prevalent.

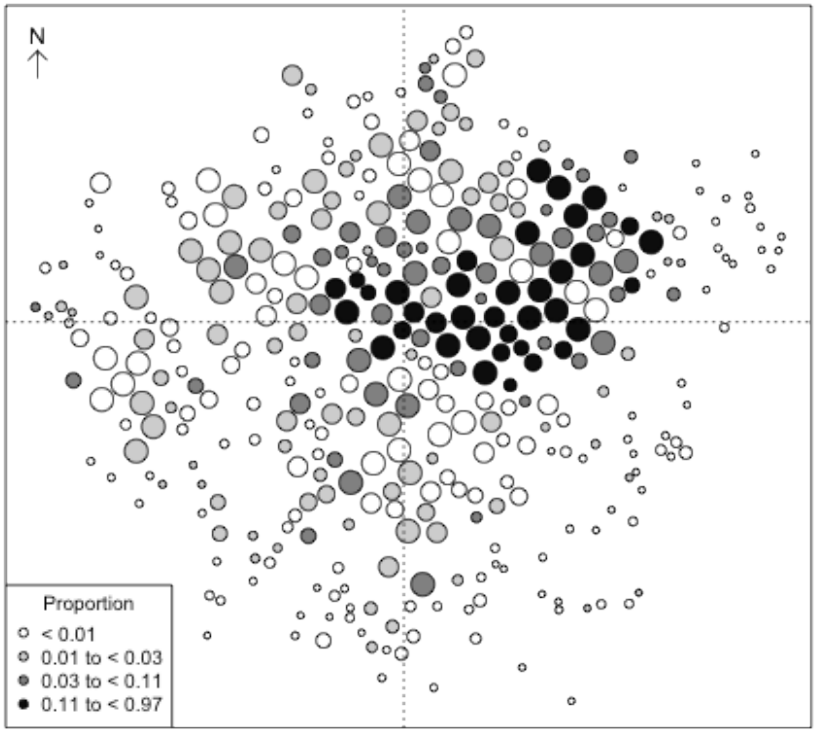
(a) Black African



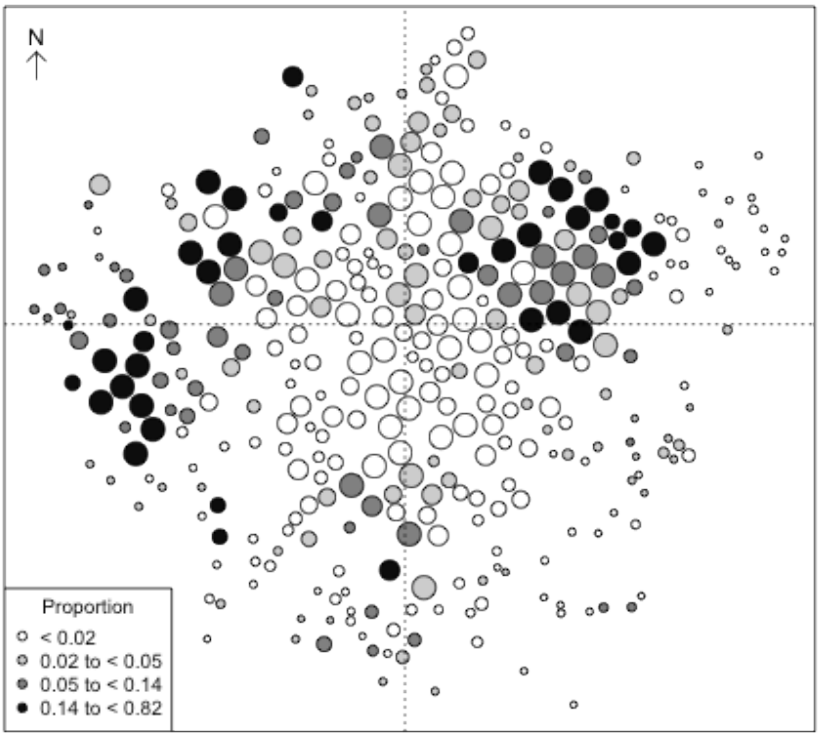
(b) Black Caribbean



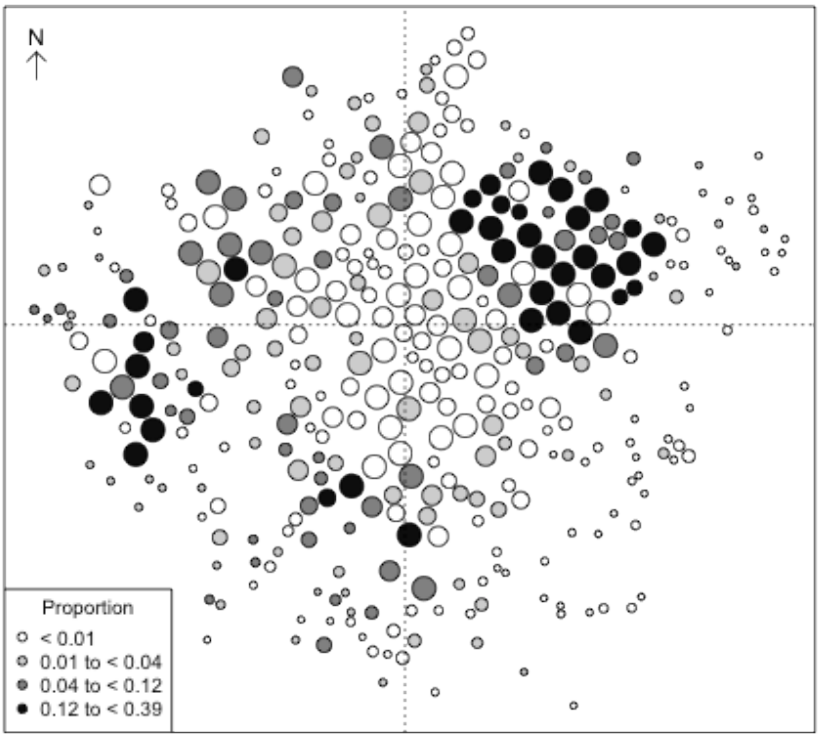
(c) Bangladeshi



(d) Indian



(e) Pakistani



(f) White British

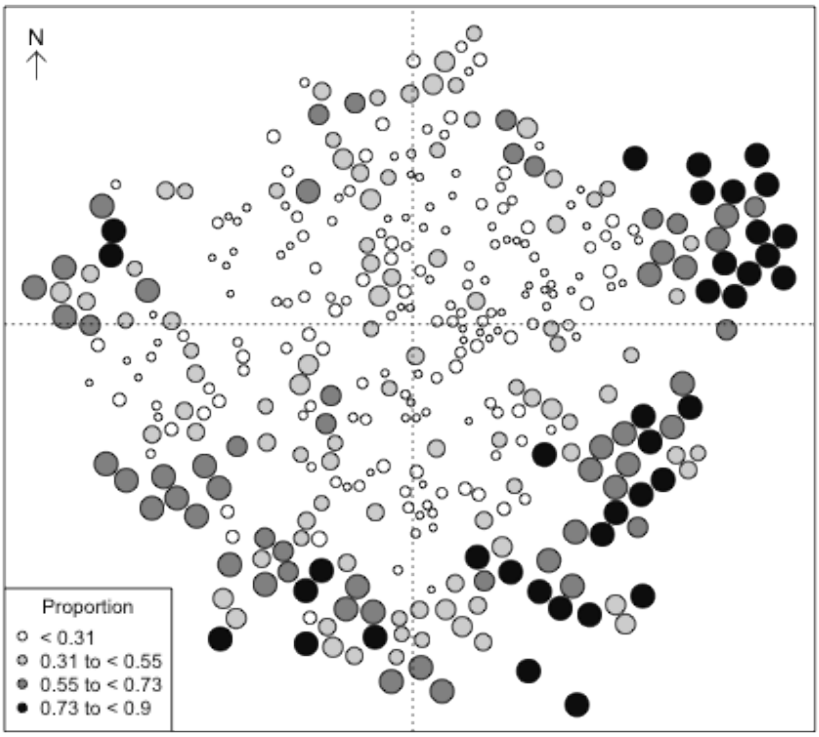


Figure 1. The proportion of the 2008 entry into London's state-supported secondary schools that are of each ethnic group. The locations of the schools are indicative only.

There is geography to how the groups are distributed. Black African and Black Caribbean pupils constitute a higher proportion of the secondary schools' intakes in areas especially to the South/South East of the city centre (the centre being where the dotted lines intersect). Bangladeshi pupils are prevalent in schools towards the centre and East of the city. Indian and Pakistani pupils are found especially to the North East of the city and to the West/South West in areas close to Heathrow airport. White British pupils tend to be educated in outer London schools.

Table 1 confirms the spatial clustering. It gives the results of a Moran test comparing the proportion of the ethnic group in any one school with the average proportion in locally competing schools (defined in Section 4 below). In all cases the test reveals positive spatial autocorrelation at a greater than 99.9 per cent confidence: schools that recruit a higher proportion of any one ethnic group tend to be competing with other schools that do likewise. The Moran value, I, is greatest for the Bangladeshi group and least for the Indian group. This may hint at the Indian pupils being more likely to separate from pupils of other ethnicities when they make the transition to secondary schools or it may simply mean they tend to be in more mixed schools.

	I	p
Black African	0.541	<0.001
Black Caribbean	0.602	<0.001
Bangladeshi	0.803	<0.001
Indian	0.530	<0.001
Pakistani	0.649	<0.001
White	0.707	<0.001

Table 1. Results of Moran tests comparing the proportion of the ethnic group in one school with the average proportion for locally competing schools. In each case there is significant positive spatial autocorrelation.

It is not surprising to find the patterns of spatial clustering; we may assume they reflect the residential geographies of where the various groups are located in London. However, they are not an inevitable outcome of those residential geographies because the UK does not operate a neighbourhood based schooling requiring pupils to attend a nearest or otherwise designated secondary school. Although many schools operate geographical based admissions criteria giving priority to those living closest to the school, most pupils do not attend their nearest school: a study by Burgess et al. (2006) estimated that only one quarter of pupils in London do so.

Of the 2008 cohort of pupils, a little more than one-quarter (27.7 per cent) attends the secondary school closest to their primary school. The average primary school is sending the bulk of its pupils to one of five secondary schools, with an interquartile range (IQR) from three to eight secondary schools. Reciprocally the average secondary school is receiving from approximately 27 primary schools, with an IQR from 17 to 36. These statistics are calculated for the least number of schools that send/receive 90% of the pupils. More exceptional connections between primary and secondary schools that would otherwise inflate the values are ignored. Nevertheless, the statistics still risk an

exaggerated impression of the impact of choice on the transitions from primary to secondary school. There are three reasons why.

First, the secondary school attended by a pupil is not necessarily a matter of their or parental choice. In 2008, 36 per cent of pupils in London were not allocated to their first preference school, and 14 per cent did not receive any of their first three preferences. These values vary by local authority with the rate of unsuccessful first preference applications ranging from 9.9 per cent (Harrow, to the NW and edge of London) to 49.2 per cent (Wandsworth, near the centre but south of the River Thames). The percentage unsuccessful for any of their first three preferences ranges from 1.6 per cent (Harrow again) to 21.6 per cent (Hackney, to the NE of the centre). (The data are available from http://www.education.gov.uk/researchandstatistics).

Second, even if a pupil does not attend the most proximate school, it does not mean they are travelling far. There are supply-side and demand-side constraints limiting such travel. In regard to the former, the use of geographical based admissions criteria will impose limits for over-subscribed schools. For the latter there are practical and pragmatic reasons why a pupil is likely to prefer a reasonably close school, including transportation and wanting to stay with existing friendship groups. For the 2008 cohort of pupils, 56.1 per cent attend a secondary school that is within two kilometres (1.24 miles) of their primary school, and 82.5 per cent are within four kilometres.

Third, the propensity to attend the nearest or a near secondary school varies by ethnic group with 22.2 per cent of Black African and 18.3 per cent of Black Caribbean pupils attending the secondary school nearest to their primary, compared to 38.7, 32.7, 36.7 and 30.6 per cent of Bangladeshi, Indian, Pakistani pupils and White British pupils,

respectively. Whereas less than half (45.3 per cent) of Black Caribbean pupils attend a secondary school within two kilometres of their primary, over four-fifths (82.0 per cent) of Bangladeshi pupils do.

Table 2 summarises these differences by ethnic group in the transitions from primary to secondary school. It also shows the proportion of the group that are in voluntary-aided (VA) Church of England or Roman Catholic schools, and the proportion that are in academically selective schools. Such schools are of relevance because they are amongst the minority for which admissions criteria showing commitment to the faith group or testing academic ability are of greater importance than residential location, allowing them to recruit over greater distances. It is notable that 34.2 per cent of Black African pupils and 29.7 per cent of Black Caribbean pupils (the groups travelling furthest to school) attend a VA faith school, compared to 20.4 per cent of all pupils in the 2008 cohort. Almost twice as many Indian pupils attend an academically selective school than do all pupils in the cohort.

	All	Black African	Black Caribbean	Bangladeshi	Indian	Pakistani	White	FSM
Proportion of all pupils	-	0.116	0.064	0.053	0.052	0.038	0.408	0.268
Proportion in nearest secondary school to primary	0.277	0.222	0.183	0.387	0.327	0.367	0.306	0.299
Proportion within 2km of primary school	0.561	0.503	0.453	0.820	0.698	0.754	0.568	0.628
Proportion within 4km of primary school	0.825	0.788	0.769	0.946	0.880	0.912	0.855	0.867
Proportion in a VA faith school	0.204	0.342	0.297	0.066	0.071	0.04	0.175	0.154
Proportion in a selective school	0.038	0.021	0.004	0.014	0.073	0.03	0.046	0.004
Unevenness ratio (a)	-	3.832	3.437	4.873	3.966	3.636	7.169	5.074
Unevenness ratio (b)	-	1.081	1.054	1.019	1.109	1.062	1.017	1.163

Table 2. Summary statistics describing the distances travelled by members of the various ethnic groups in the transition from primary to secondary schools in London, the proportion that attend voluntary-aided or academically selective schools and whether the groups are more unevenly distributed than if all pupils (a) were randomly allocated to a secondary school, and (b) attended the nearest secondary school to their primary.

Table 2 also shows how unevenly each group is distributed amongst the schools relative to how uneven that distribution would be if (a) the pupils were randomly assigned to schools, respecting capacity constraints but not the logistical problems posed to the pupils were such a policy actually adopted, and (b) all the pupils attended the nearest secondary school to their primary, ignoring any real-world capacity constraints. Specifically an unevenness ratio is calculated as,

$$\mathrm{U}_k = \frac{n^{-1}\sum_{i=1}^{n}\left|p_{i(\mathrm{OBS})} - p_k\right|}{n_2^{-1}\sum_{i=1}^{n_2}\left|p_{i(\mathrm{EXP})} - p_k\right|} \qquad n_2 \leq n \qquad [1]$$

where p_k is the proportion of all pupils that are of the ethnicity group (in the 2008 cohort), $p_{i(\mathrm{OBS})}$ is the observed proportion of the group in each of the n secondary schools and $p_{i(\mathrm{EXP})}$ is either (a) the expected proportion if the pupils are assigned randomly, or (b) the expected proportion in each of n_2 secondary schools if every pupil attended the nearest primary. The random assignment uses a Monte Carlo approach averaging over 10 000 simulations. For scenario (b) the value n_2 is less than n because assigning pupils to the secondary school closest to their primary can leave some schools empty.

Using the first of these measures, pupils are found to be markedly more unevenly distributed by ethnicity group than if they were randomly distributed. This is no surprise given the clear patterns of positive spatial autocorrelation shown in Figure 1 and Table 1. Here the unevenness ratio can be interrupted as a measure of how concentrated any one group is in schools across the study region. Notably, it is White British pupils that are, in this sense, the most 'segregated'.

Using the second measure, the Indian group are found to be the most unevenly distributed relative to if all pupils had attended the secondary school nearest to their primary. Care must be taken with the interpretation of this finding. It does not mean that this group is the one that is most self-segregating. It just means that if *all* pupils attended the nearest secondary it would leave Indian pupils more evenly distributed across schools. In fact, we know that Indian pupils are more likely than many to be attending a near school so we should not conclude that the unevenness as it currently exists is a consequence of their decisions. It is a function of decisions made across the groups.

In any case, the increase in unevenness found for the Indian group is only eleven percentage points against the benchmark. The Black African group are found to be about eight percentage points more unevenly distributed than if they attended the nearest secondary school, the Black Caribbean are about five percentage points more unevenly distributed, the Bangladeshi group are by about two, the Pakistani group by six, and the White British group by two.

In short, the distributions of the groups across the schools do not differ that greatly from if the pupils were all choosing and allowed to attend the closest primary school to the secondary. The finding implies the main cause of differences in the ethnic composition of secondary schools is "simply a reflection of the clustered patterns of residence, which are largely a result of a sequence of labour shortages, immigration, natural growth and suburbanisation" (Finney & Simpson 2009, p.105).

Moreover, and by way of comparison, Table 2 includes the same information for pupils that are eligible for free school meals (FSM, a crude but widely used

measure of living in a low or lower income household). None of the (non-white) groups is as unevenly distributed as the FSM-eligible group. A Department for Children, Schools and Family study cited by Finney and Simpson (*op. cit.*) showed the same: that school sorting does occur over-and-above sorting by neighbourhoods but more so by income than by ethnicity (DCSF 2008), with the possibility that the two are confounded.

4. Measuring ethnic segregation within the local market for schools

The statistics presented in the previous section are global statistics, ones calculated for the entire study region. Earlier the case was made for localised measures of segregation that consider the markets within which schools compete in the general sense of them recruiting from the same places. The Moran scores of Table 1 were based on a comparison of each school with its average local competitor where locally competing secondary schools are defined as those that draw their intakes from one or more of the same primary schools (Harris 2011).

Specifically, competition is defined by a (spatial) weights matrix where the weight between any two competing schools (*i* and *j*) is a function of the proportion of secondary school *i*'s intake drawn from primary schools shared with school *j*, multiplied by the proportion of secondary school *j*'s intake drawn from the same. This is the joint probability that a pupil selected at random from secondary school *i* attended the same primary school as a pupil selected at random from secondary school *j*. The weights are then scaled (row-standardised) so that the sum of the weights for any school equals one.

Having defined the weights in this way, a simple index of local difference (ID) is formulated as

$$\mathrm{ID}_i = p_i - \sum_{j=1}^{n-1} w_{ij} p_j \qquad -1 \le \mathrm{ID}_i \le 1,\ j \ne i, 0 \le w_{ij} \le 1, \sum w_{ij} = 1 \qquad [2]$$

The properties of this index are described in Harris (2012). It ranges from -1 to 1, where a value above zero indicates that a school recruited a higher proportion of a group than the (weighted) average proportion for locally competing schools. A value below zero indicates it recruited a lesser proportion. It is a spatial index in the sense that if the locations of the schools were changed the index values would change too (because the connections between the schools would undoubtedly change, affecting the weights matrix and therefore the results). It is also local in that an index value is calculated for each secondary school in turn: the composition of each is compared to locally competing schools. Hence a distribution of values is obtained.

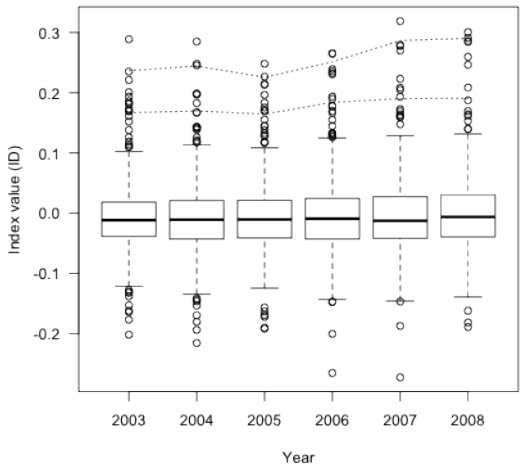
Figure 2 shows the distributions for each of six ethnic groups. For example, the left side plot of Figure 2(a) shows whether there is a higher or lesser proportion of Black African pupils in a school relative to locally competing schools. A separate distribution is shown for each of six cohorts of pupils, those who entered secondary schooling in each of the academic years from 2003 through to 2008.

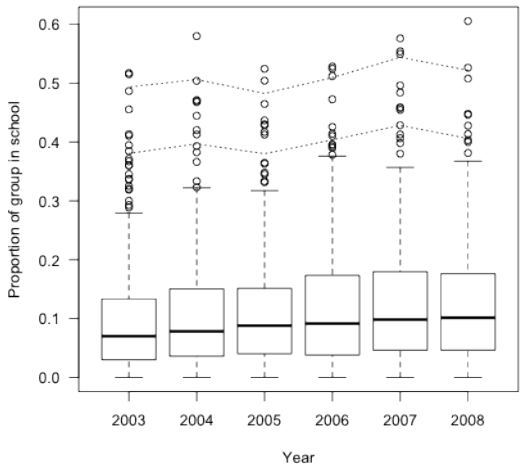
Marked on the plots is the mean index value calculated only for schools with values exceeding the 95th and 99th percentile of the distribution, for the most extreme cases. The trend in these values indicates whether schools that are most different from other schools locally are becoming more or less different over time. To aid the comparison, the weights matrix is fixed to the year 2003 so, for

example, the index of difference for 2008 is comparing schools that were competing in 2003, regardless of whether they still do so. The right side plot simply shows how the proportions of Black African pupils are distributed between each of the schools.

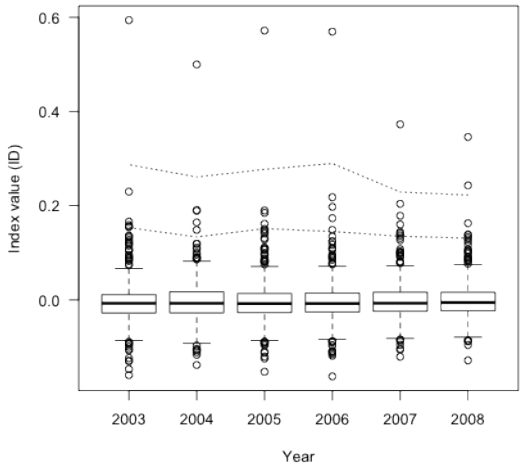
Looking at the plots and excepting the Pakistani group, it is certainly possible to find, in all years, secondary schools that are predominantly or wholly filled by pupils from a single ethnic group, especially so for the Bangladeshi and Indian groups. It is also possible to find schools that strongly differ from others locally: schools that have 70-80 percentage points more Indian pupils, for example. This is not trivial. Recall that the weights matrix defines locally competing schools as those that recruit from the same primary schools. The differences are therefore subsequent to any prior sorting by ethnicity between primary schools. The distance between each school and its average competitor is not great: a mean of 1.7km with an IQR from 824m to 2.27km in 2003. Clearly there are differences between secondary schools locally. They are not all equally mixed and some contain a much greater proportion of an ethnic group than others that are nearby. As such, 'segregation' exists.

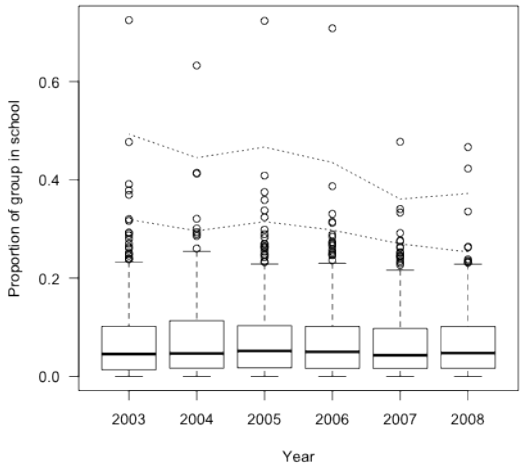
(a) Black African



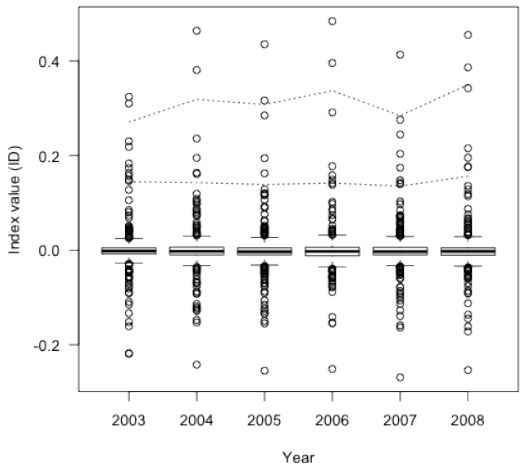


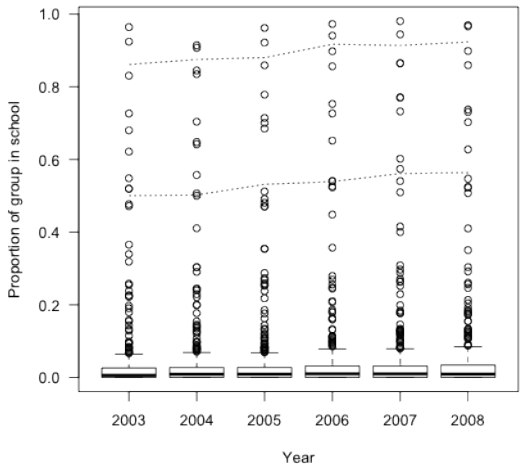
(b) Black Caribbean



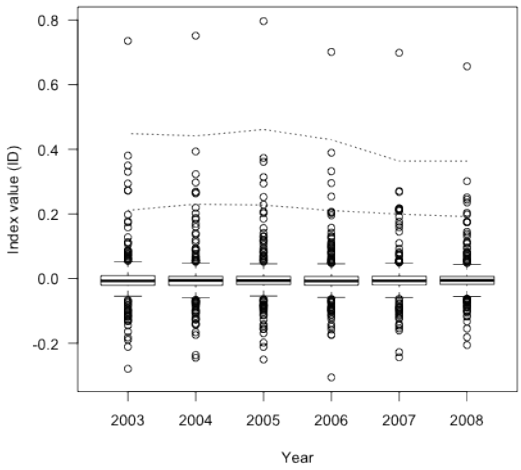


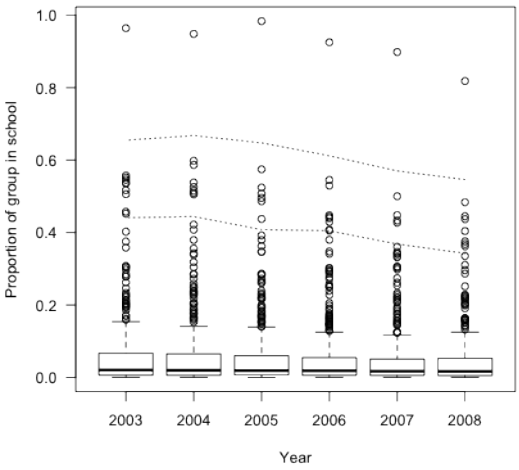
(c) Bangladeshi



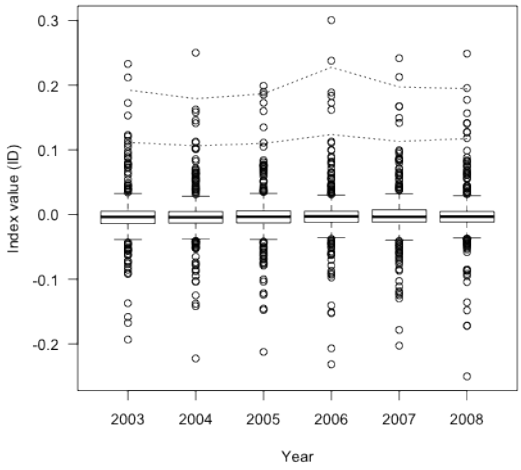


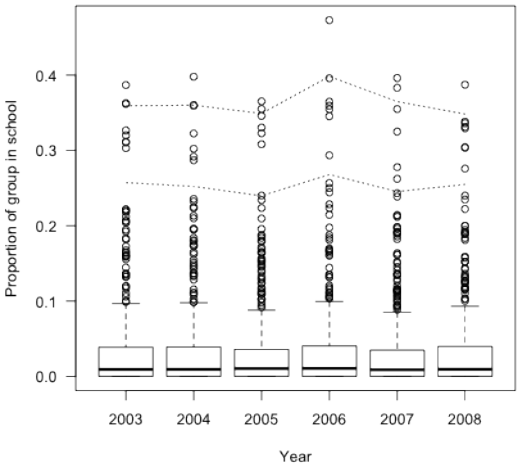
(d) Indian



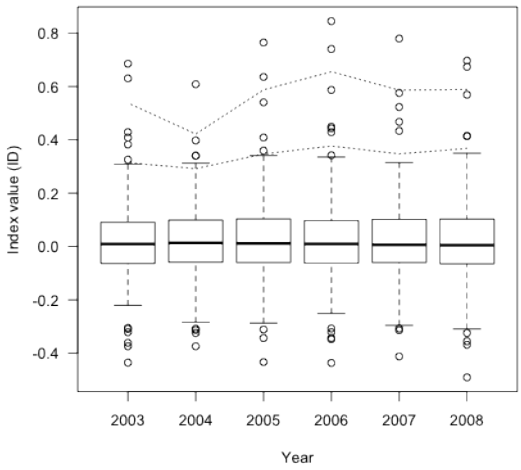


(e) Pakistani





(f) White British



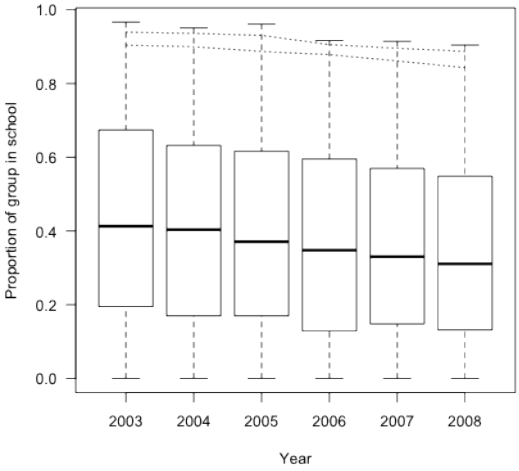


Figure 2. Showing (left) the distribution of the index values by cohort and by ethnic group and (right) the proportion of each ethnic group per school. The mean values calculated only for schools with values exceeding the 95th and 99th percentile of the distribution are also shown.

Hypothetically, how would these local differences appear if the weights matrix remained fixed (for the transitions made by pupils in 2003) but the true ethnic composition of each secondary school was replaced by that which would arise if all pupils had been allocated to the nearest-to-primary secondary? If there is some separation from each other of pupils of different ethnic groups in their transitions from primary to secondary school then we can expect the actual, observed differences between schools (as measured by the index of difference for the 2008 cohort) will be greater than for allocations made under the hypothetical (least distance) scenario.

Table 3 suggests this is indeed the case. Recall that the index of difference is calculated for each school so there are now two distributions: one for the observed differences between schools and one for the hypothesised differences. The table compares the 95th percentile, the 99th and the 100th percentiles on each of these distributions. It considers whether the local differences for schools that are most different from their average competitor are greater or less than the differences that would emerge if all pupils were allocated to the nearest secondary school. Usually they are greater (as expected) but not exclusively so. For example, Table 3 suggests that the greatest difference between locally

competing schools is, in fact, less under the actual allocations (ID_{MAX} = 0.301) than if all Black African pupils attended the nearest secondary school (ID_{MAX} = 0.353). More generally, though, the choices/allocations made by pupils increase the index of difference by an amount in the order of about five or six percentage points but greater for the Indian group especially.

	ID at percentile	Observed	Hypothetical	Difference
Black African	95th	0.122	0.119	0.003
	99th	0.269	0.215	0.054
	100th	0.301	0.353	-0.052
Black Caribbean	95th	0.085	0.072	0.013
	99th	0.138	0.122	0.016
	100th	0.346	0.175	0.171
Bangladeshi	95th	0.053	0.069	-0.016
	99th	0.203	0.204	-0.001
	100th	0.455	0.346	0.109
Indian	95th	0.082	0.084	-0.002
	99th	0.239	0.177	0.062
	100th	0.657	0.383	0.274
Pakistani	95th	0.067	0.071	-0.004
	99th	0.147	0.178	-0.031
	100th	0.249	0.186	0.063
White British	95th	0.259	0.317	-0.058
	99th	0.414	0.478	-0.064
	100th	0.697	0.638	0.059

Table 3. Comparing the index of difference values at end points of the distributions under the actual and hypothesized allocations to secondary schools in London in 2008.

A second consideration is whether the apparent 'segregation' is increasing. Here we focus on two groups the Headteacher was reported to be concerned about and for which the index does appear to indicate growing local differences

between schools in the most extreme cases (in Figure 2): Black Africans and Bangladeshis.

Looking at the Black African group first, in addition to the trends in the index values, the proportion of Black Africans in the schools where the group are most prevalent also appears to be rising. However, the prevalence of the group amongst all school pupils is rising too. In 2003, 8.79 per cent of the school population (as recorded in the data) was Black African, 9.76% in 2004, 10.1% in 2005, 10.9% in 2006, 11.6% in 2007 and 11.6% in 2008.

Comparing the cohorts for years 2003 and 2008, a sizeable proportion of Black African pupils are found in an increasing number of London schools. In 2003, 4.45 per cent all of schools were 30 per cent or greater Black African but not majority Black African; by 2008 the corresponding value was 5.19 per cent. In 2003, 34.3 per cent of all schools were 10 per cent or greater but not majority Black African; by 2008 the value was 49.7 per cent. Although it is also true that the percentage of schools that were majority Black African increased from 0.524 to 0.820 over the same period, this increase is less than at other thresholds. Taken together, these changes suggest not a process of segregation but the opposite, of the group being more widely dispersed across schools (which is also evident from the generally increasing IQR and 'whiskers' shown in the right-hand plot of Figure 2a).

The same is true of Bangladeshi pupils. Although the index of difference may again be increasing in the most extreme cases, as with Black African pupils the group forms a growing proportion of the school population (4.19 per cent in 2003, 4.23% in 2004, 4.54% in 2005, 4.80% in 2006, 4.96% in 2007 and 5.35%

in 2008) and has become more widely distributed across London's schools. In 2003, 6.81 per cent of all schools were 10 per cent or greater but less than 75 per cent Bangladeshi; by 2008 the value was 10.1 per cent. The percentage that is at least 75 per cent Bangladeshi has increased too, from 0.785 to 1.09 but, again, the change is at a lower rate.

The suspicion is that the apparent increases in the index of difference are driven by demographic changes. This can be tested by asking if the rate of change is proportional to the group's increased prevalence amongst the local school population: if,

$$\begin{aligned} &\frac{\mathrm{ID}_{t2}}{\mathrm{ID}_{t1}} = \frac{p^*_{t2}}{p^*_{t1}} \\ \Rightarrow &\frac{\mathrm{ID}_{t2}}{p^*_{t2}} = \frac{\mathrm{ID}_{t1}}{p^*_{t1}} \end{aligned} \qquad [3]$$

where the local prevalence of the group, p^* can be estimated as proportional to its prevalence in a school and its average competitor. This logic gives rise to the index of clustering, which is

$$\mathrm{ICL}_i = \frac{\mathrm{ID}_i}{p_i + \sum_{j=1}^{n-1} w_{ij} p_j} \qquad -1 \le \mathrm{ICL}_i \le 1,\ j \ne i, 0 \le w_{ij} \le 1, \sum w_{ij} = 1 \qquad [4]$$

This index measures the local differences between schools relative to the local prevalence of the ethnic group. The index reaches it maximum when any pupils of the group are wholly found in one school and none of its competitors, and reaches its minimum when there is none of the group in the school but there are in competing schools.

Figure 3 shows the distribution of the index values for the Black African and Bangladeshi groups. Once compositional effects are taken into account there really is no evidence to suggest that segregation has either increased or decreased in the local markets for schools. To be sure, there are notable differences between the schools but, relative to the group's presence in the local population, they are not increasing.

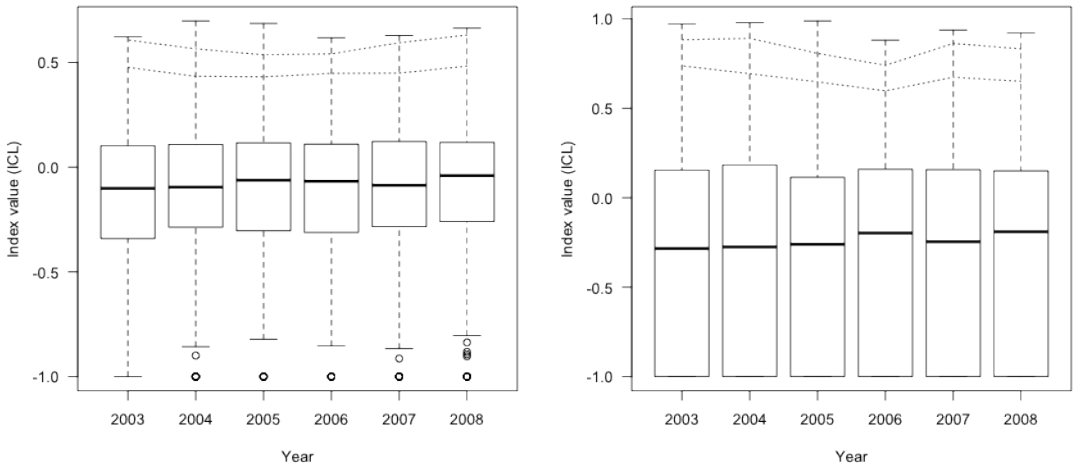


Figure 3. Showing the distribution of the index of clustering for (left) Black African and (right) Bangladeshi pupils.

5. Conclusion

This paper has used innovative methods of geocomputational analysis to consider the extent to which segregation by ethnicity exists in London's secondary schools and, if it does, whether it is increasing. It presents a mixed picture. Certainly there are differences between schools locally and some of these differences are quite stark. However, we need to be wary of presenting the most extreme cases as the norm. More commonly the differences do not seem to

veer too greatly from what would occur if all pupils simply attended the nearest secondary school to their primary. There is also little, if any, evidence to suggest those differences are growing, at least not when demographic changes are taken into consideration.

Of course, the debatable words are "too greatly". For anyone who would aspire for schools to either represent the ethnic mix of their surrounding neighbourhoods or, even better, to ameliorate residential differences by being better mixed than neighbourhoods, any increase in the concentration of particular ethnic groups in particular schools will be a disappointment, a sentiment that is laudable. However, there are social justice arguments in favour of school choice and in not simply reproducing patterns of, for example, neighbourhood disadvantage by directing which school a pupil must necessarily attend. Choice, precisely because it is choice, can produce outcomes that some do not approve of but that are attractive, for whatever reasons, to those who make the choices. To deny them that choice, either directly or indirectly by overt criticism of them, raises issue of power as well as equality of opportunity.

The 'unspoken' presumption is that school choices are made such that pupils can be schooled with others of a similar ethno-cultural kin. There are at least three arguments that weaken this presumption. First, school allocations are not necessarily a matter of choice but of the overall matching of supply and demand for school places. Second, sorting by ethnicity may be confounded with sorting by income. In 2008, the (non-parametric) Spearmen's rank correlation between the proportion of pupils in a London secondary school of any of the Black African, Black Caribbean, Bangladeshi, Indian and Pakistani groups, with the

proportion eligible for free school meals was r_S = 0.568 (p < 0.001). Third, research by the Runnymeade Trust has shown overall preferences among minority ethnic parents for their children to attend ethnically mixed schools (Finney & Simpson 2009 citing Weekes-Bernard 2007).

In summary, and taking the evidence in the round, it appears premature and overly alarmist to suggest London's schools are "sleepwalking towards Johannesburg" no matter how well intentioned (or possibly misreported) the Headteacher's comments may have been.

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