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## ***Rethinking the Analysis of Ethnic Residential Patterns: Segregation, Isolation, or Concentration Thresholds in Auckland, New Zealand?***

*Data from the 1996 New Zealand Census on ethnicity in Auckland Urban Area are used to illustrate a new approach to measuring spatial separation. The traditionally employed single-number indices are found wanting and a method based on thresholds is introduced. This provides more detailed information on the geography of ethnic groups that is consistent with the requirements for testing hypotheses regarding the relationship between social and spatial distance. The results show that (with a few exceptions) Polynesian groups were more encapsulated groups in Auckland than were Asian and European groups, and that most of the European groups—along with the “host society,” the New Zealand Europeans—were not spatially exposed to members of the Polynesian and Asian groups.*

After decades of debate on the nature of residential segregation and how to measure it, research has tended to lapse into a degree of theoretical, methodological, and even terminological uncertainty, associated with the promotion of a variety of different definitions and measures (Massey and Denton 1988, p. 282). Consistency and comparability certainly, and potentially the validity of the research area itself, all suffer as a result. None of this is satisfactory at a time of burgeoning interest in the social dynamics of plural, ethnically heterogeneous cities (Grillo 2000) or EthniCities (Roseman, Laux, and Thieme 1996). In particular, established relationships between ethnic residential patterns and social distance from the host society, through the operation of the housing market, bear on issues of social discrimination and exclusion, and of economic disadvantage, as well as positive reasons for ethnic group segregation associated with retention of cultural identity. Hence the continuing need, not only to continue the debate about theories of the nature and dynamics of ethnic group concentration in urban areas, but also to develop methodologies that can accurately map and describe the social geographies of ethnic groups in light of developing theory. This paper examines several major aspects of the methodological debate, looking especially at the indexes of segregation and isolation and at a new, threshold

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analysis methodology, in the context of recent developments to the theorization of the nature and dynamics of ethnic group concentrations. The case study application is to Auckland, New Zealand's largest and arguably best example of a modern EthniCity.

#### MEASURING ETHNIC GROUP CONCENTRATION

Two important issues regarding the measurement of ethnic group concentrations center on the use of single index values and comparability over time and space. Although many researchers have adopted a single index approach to the measurement of ethnic concentrations, in fact this oversimplifies the situation. Massey and Denton (1988, 1989) identified at least five main and largely independent dimensions of segregation, each with its own index or set of indexes. The most well known of these dimensions is identified as *evenness* (or *difference*), measurement of which is associated with the Index of Dissimilarity (ID) and the related Index of Segregation (IS: Duncan and Duncan 1955; see also Taeuber and Taeuber 1965). Both are relative measures of the difference between the distribution of one population group compared with another across the constituent parts of an urban area: with the ID, the comparison is between two groups within the population; the IS contrasts the distribution of one group with that for the remainder of the population.

However, because the evenness dimension, along with those of *concentration* (the amount of physical space occupied by a minority group), *centralization* (the degree to which an ethnic group is spatially concentrated near the center of a city), and *clustering* (the distribution of ethnic groups relative to each other), are relative measures, the patterns they describe are unique to each city. There is comparability in the way in which results relate to theory in general, but not in terms of the nature of the patterns from one city to another. This is because the indexes are assessed in terms of relativities unique to each individual city; every time a study area changes, either over time or to another city, the base line changes. The development of a generalized theory of ethnic group concentration is thus precluded. The other Massey and Denton dimension, *exposure*, or *isolation*, is based on a measure of probability, in this case of potential contact or interaction among minority and majority group populations at the local area level; it provides an absolute measure, but on only one dimension.

Three needs arise when determining how to measure ethnic group residential concentration. One is to maintain a close link between measure and theory. A second is comparability both within a city across ethnic groups and among cities at both the national and international level. The third is to develop absolute indicators which directly address the issue of segregation.

Peach's (1999) recent work has pointed the way with regard to the last of these desiderata, and thereby the first two as well. He has suggested focusing on three main aspects of ethnic group segregation:

1. The degree of *residential concentration* for any ethnic group;
2. The degree of a group's *assimilation*, reflected spatially in the extent to which it shares residential space with the host society and with other groups; and
3. The degree of *encapsulation*, or *spatial isolation*, of any group from both the host society and from other ethnic groups.

A high level of encapsulation would involve both the existence of areas of the city in which an ethnic group formed a large proportion of the local population, and a substantial proportion of the group's members living in those areas. Peach placed these measurement elements within the context of two main theoretical models; an *assimilationist model*, where, as cultural and economic differences between an ethnic minority and its host society are removed, they become more spatially (and socially) mixed, following Park's (1926) classical equation of spatial and social distance; and a

*pluralist model*, where spatial segregation remains high over time. [On segregation scenarios, see Boal (1999).]

The pluralist model itself has two variants. One is involuntary pluralism, where an ethnic group is constrained to live in ghettolike concentrations because of continuing discrimination on the part of the host society. The other is voluntary pluralism, where at least a substantial proportion of an ethnic group's members chooses to remain in separate residential enclaves, generally to preserve aspects of their cultural identity. To this latter variant may be added situations in the United States where, although groups were transformed, or "Americanized," losing original attributes such as culture and language (at least in part), they were recreated in such a way as to remain as identifiable groups (Glazer and Moynihan 1970, pp. 12–17). Thus at any one time, members of an ethnic group will, according to these theoretical models, be more or less spatially, and by implication socially, segregated.

Although he also used standard, relative measures of ethnic residential segregation (the ID and IS), Peach (1996) employed absolute rather than relative measures of segregation to identify the levels of spatial encapsulation. He drew on Philpott's (1978) work, arguing that the focus of attention should be on

- the absolute percentage of a local area's population composed of a particular ethnic group; and
- what proportion of that group's total urban population lived in each local area.

These take into account both local area concentration and the citywide size of a group. Unfortunately, none of the usual measures of segregation directly measures these; nor do the spatial extensions of them developed by Wong (1993, 1998). Of the five dimensions and associated measures identified by Massey and Denton (1988), for example, that of concentration refers to living at high population densities (which may be an indicator of economic disadvantage, but not necessarily so), whereas that of centralization refers to relative location in the city—which again may have no direct relationship to any of the disadvantage/discrimination/cultural identity processes. Their clustering dimension is an index of contiguity, which is not a necessary feature of segregation models: members of a group may live in several, spatially distinct, areas of concentration, rather than one.

Of Massey and Denton's five dimensions of segregation, therefore, three do not meet the criteria for residential concentration set here: what proportion of a city's ethnic group population lives in areas where that group forms a given percentage of the local total? And what proportion lives in areas where other groups form a given percentage of the total? Each of the other two dimensions—exposure and evenness—have greater potential in this respect, but are insufficient. The index of segregation, for example, is a measure of unevenness between two maps; it indexes the degree to which a group's members live apart from the remainder of the population. At the extreme, a high index of segregation also indicates a high level of residential concentration: if most of the group members live in areas where there is an absence of others, then clearly they are "spatially encapsulated." But two maps may be very different, producing a high index of segregation—of over 50, say: the index varies between 0 and 100—yet without the "spatial encapsulation in the absence of others at the local area level" criterion being met. This is particularly likely to be the case with small groups, which is why correction factors have been suggested to take group population size into account (see Voas and Williamson 2000).<sup>1</sup>

Measures associated with the exposure dimension appear to have greater potential for indexing "spatial encapsulation" as defined here. Most of them, notably the widely

1. This is the case, for example, in Fong and Shibuya's (2000) recent work on the segregation of the poor, by ethnic group, in Canadian cities.

used measures developed by Lieberman (1981), are indices of the degree to which groups are spatially separated. Lieberman's index of isolation, for example, is interpreted as the probability of a group member meeting another member of that group at random within a defined area—and the greater the proportion of that area's population who are members of the group, the higher the probability. But as a single measure—the average for all members of the group within the city—such an index provides at best only a summary measure of the degree of 'spatial encapsulation'.

### *Recent Advances*

One approach to these issues has been to use multiple indices in the same study. Friesen et al. (2000), for example, have used Lieberman's (1981) index of isolation alongside the index of dissimilarity in their study of ethnic segregation and isolation in Auckland. But they remain separate measures, reflecting independent dimensions of segregation. Is there an absolute approach to the measurement problem which can directly indicate the degree of group spatial separation? Peach's (1996) answer to this, consistent with his theoretical models of assimilation and pluralism, was to introduce the notion of an absolute "threshold level," based on patterns where concentrations of particular ethnic groups were 30 percent or higher of total local (subarea) populations (see also Jargowsky 1997). Commenting on this approach, Poulsen, Johnston, and Forrest (2002) argue a need to examine absolute concentrations in greater detail, at 20, 30, 40 ... 80 percent threshold levels, for example, thereby neither restricting the study to a set of general summary indices nor confining it to one particular threshold level. The use of absolute values provides for comparative studies of ethnic group concentrations from place to place and over time, independent of individual city baseline values.<sup>2</sup>

Expansion of Peach's single threshold value to a more comprehensive threshold analysis methodology allows production of general summary threshold profiles for each population group to establish and map where groups either form a majority, are dominant (that is, the modal group in the area), or exceed one or more of a set of concentration levels (Poulsen, Johnston, and Forrest 2000; Johnston, Forrest, and Poulsen 2001). Measurement proceeds as follows:

- For each group, measure its percentage of the total population in each areal subdivision of the city being studied; and
- For a series of concentration thresholds—percentages of an area's population—compute the percentage of the group's members who live in areas where they exceed that threshold. The selection of thresholds is necessarily arbitrary. It can be as coarse- or as fine-grained as analysts wish.

This threshold analysis methodology is a superior approach to the analysis of ethnic enclaves and degree of segregation using summary indices. It directly addresses the question raised by Peach (1996): what percentage of a group's members live in areas where they form  $x$  or more percent of the population total, where  $x$  can be any value between 0 and 100? Answers to this question not only specify the degree of spatial segregation at the specified threshold, but provide data that are comparable over time and space. Over time, for example, the assimilation model suggests that the degree of segregation should decline: the threshold measures indicate whether it has, and by how much, using a metric that is not affected by either the group's size or changes in its size between the two dates. Similarly, comparisons over space can be made that are independent of the size of the cities involved and the ethnic groups—the measures provide absolute indications of segregation levels [assuming that the

2. Comparative work will be difficult if the areas used are on average large relative to the size of the ethnic groups.

mesh of areas employed is fine-grained enough: the procedure would not provide valuable information for small groups and large areas, which is true also of the indices of dissimilarity and segregation (Johnston, Forrest, and Poulsen, 2001; Johnston, Poulsen, and Forrest (2001)).<sup>3</sup>

As a brief illustration of the methodology, take the case of the Maori in Auckland. We have selected seven thresholds—80, 70, 60, 50, 40, 30, and 20 percent—and calculated the percentage of the city’s Maori who live in areas where they exceed that percentage of the local population. The figures are 0.3, 0.3, 0.6, 2.8, 9.3, 23.2, and 47.0, respectively. Thus a little under half of Auckland’s Maori live in areas where they form at least 20 percent of the total population, and only 2.8 percent live in areas where they are in a majority (that is, exceed the 50 percent threshold). This sequence of figures suggests some spatial separateness, but certainly not a high degree of “spatial encapsulation”—and can be compared with indices of segregation and isolation of 37.9 and 0.21, respectively.

RESIDENTIAL CONCENTRATION IN AUCKLAND

This paper uses data from the 1996 Census for Auckland, New Zealand—a multi-ethnic city (Table 1) and the country’s largest—to illustrate the advantages of the threshold methodology outlined here. The data are taken from responses to the ethnicity question in New Zealand’s 1996 Census, which report ethnicity as self-defined identity, with the Census definition provided to guide respondents:

a social group whose members have the following four characteristics: a shared sense of common origins; claim a common history and destiny; possess one or more dimensions of cultural collective identity; and feel a unique sense of collective solidarity.

Twenty-four separate ethnic identities were tabulated, with additional “other” categories (Table 1).

TABLE 1  
Ethnic Groups in Auckland, 1996

NZ European	454,413	Maori	118,620	Chinese	45,198
				Korean	9,444
				Japanese	3,444
British/Irish	104,706	Samoan	57,552	EAST ASIAN	58,086
		Tongan	22,350		
		Cook Is	21,504	Indian	23,643
Dutch	11,463	Niuean	12,918	Sri Lankan	2,346
South Slav	5,742	Fijian	4,674		
German	3,291	Tokelauan	1,197	SOUTH ASIAN	25,989
Italian	1,473			Filipino	4,203
Polish	1,113	Other Pacific Is	1,752	Khmer	2,049
Greek	702	PACIFIC IS	120,740	Vietnamese	1,932
Other European	16,740	POLYNESIAN	239,360		
EUROPE	40,524			Other S E Asian	4,839
Australian	16,077			S E ASIAN	13,023
				Other Asian	2,529
				ASIAN	99,627

3. Scale is certainly a relevant issue for this approach: in general, the larger the average size of the areas being analysed, the lower the degree of encapsulation is likely to be—but this issue remains to be explored in further detail later.

We use the data at the census mesh block scale; there were 7,100 of these in the Census-defined Auckland Urban area, with an average population of 140 persons—the total population was 991,395.<sup>4</sup> These areas are much smaller than those employed in the maps and analyses in Friesen et al. (2000) and allow us to study residential concentration in great detail; if there is substantial spatial encapsulation in Auckland, it should be readily identifiable at this spatial scale.

Table 1 shows the size of the various ethnic groups. Those identifying as New Zealand Europeans form less than half (45.8 percent) of the total population, with the Maori and Pacific Islanders constituting 12.0 and 12.2 percent respectively, and those identifying themselves as British or Irish a further 10.6 percent. Some 40,500 identify with other European countries, with the Dutch being the largest contingent (1.2 percent of the total population), and 99,600 expressed Asian identities, with the Chinese (4.6 percent of the total) and Indians (2.4 percent) composing some two-thirds of the total from that continent. Individually, many of the groups are small, yet if the cultural arguments for residential concentration are valid in this case, then their claims for separate identity may be reflected in their occupying separate residential areas.

For the remainder of this paper, we treat the New Zealand European as the “host society”; although the New Zealand Maori preceded them in settling the country by several centuries, the New Zealand Europeans are the country’s economically and politically dominant ethnic group, and hence much the most powerful in the manipulation of urban space. The New Zealand Maori numbers were decimated during the first two centuries of contact with the *pakeha* (their term for foreigners); they grew rapidly in the late twentieth century, however, when mass migration to the urban areas began—with the majority of the migrants entering low-status, poorly paid occupations. Pacific Island migration to New Zealand in substantial numbers—mainly to Auckland—began in the 1960s, but accelerated at the century’s end; most of the country’s Asian migrants (again, they are concentrated in Auckland) arrived in the last two decades, adding significantly to the city’s ethnic diversity—with many of them entering much higher status occupations than the New Zealand Maori and the Pacific Islanders.

For comparative purposes we have calculated the indexes of segregation and isolation for twenty-five groups: eighteen of these refer to individual ethnic groups, with the remainder being all non-British-and-Irish Europeans, all Pacific Islanders, all Polynesians (that is, Pacific islanders plus Maori), all East, South, and Southeast Asians, and all Asians (Table 2). Figure 1 shows little relationship between the two indices: indeed, somewhat perversely, it seems, given the general understanding of the concept of segregation, it shows that the groups with the highest indices of segregation also have some of the lowest indices of isolation. This pattern is not surprising when you recall that the index of segregation is a relative measure of concentration and the index of isolation an absolute measure.

The index of isolation varies from 0.03 to 0.53: the low indices suggest groups that are widely distributed across the city, with very low probabilities for any member that another resident of the same census area claims membership of the same ethnic group; the high indices suggest that the most segregated groups on this measure (that is, those most likely to live in areas with others who have the same ethnic identity) are the New Zealand Europeans, and the Pacific Islanders and Polynesians collectively. There is a close relationship between a group’s size and its isolation index (Figure 2; the  $r^2$  is 0.84); large groups are the most isolated. The indices of segregation range from 25.8 (for the British/Irish) to 95.1 for the Tokelauan Islanders—with a mean of 61 suggesting a very fragmented city. There is virtually no relationship with group

4. Ethnic data for any group are suppressed for any mesh block where they number three or less.

**TABLE 2**  
**Indices of Residential Segregation and Isolation for Ethnic Groups in Auckland, 1996**

	ISeg	IIsol		ISeg	IIsol
NZ European	30.7	0.53	Chinese	50.4	0.14
British/Irish	25.8	0.14	Korean	74.1	0.06
European	33.4	0.03	Japanese	84.1	0.03
Australian	41.1	0.03	East Asian	46.9	0.15
Maori	37.9	0.21	Indian	53.6	0.08
Samoan	58.5	0.19	Sri Lankan	90.9	0.04
Tongan	67.2	0.11	South Asian	53.7	0.08
Cook Is	62.0	0.10	Filipino	82.7	0.04
Niuean	69.3	0.07	Khmer	93.6	0.06
Fijian	78.9	0.03	Vietnamese	93.5	0.05
Tokelauan	95.1	0.04	Southeast Asian	62.2	0.03
Pacific Islanders	57.7	0.35	Asian	37.3	0.19
Polynesian	51.2	0.47			

NOTE: ISeg—Index of Segregation; IIsol—Index of Isolation

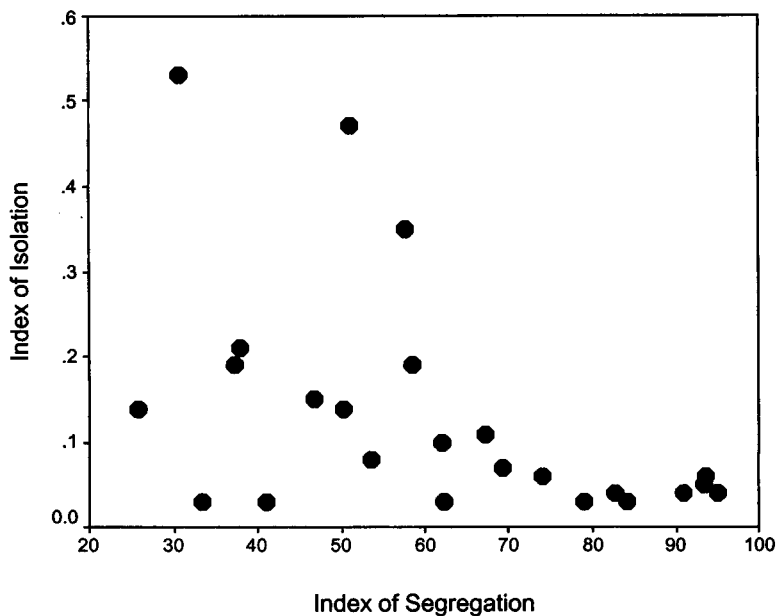


FIG. 1. The Relationship between the Index of Segregation and Index of Isolation

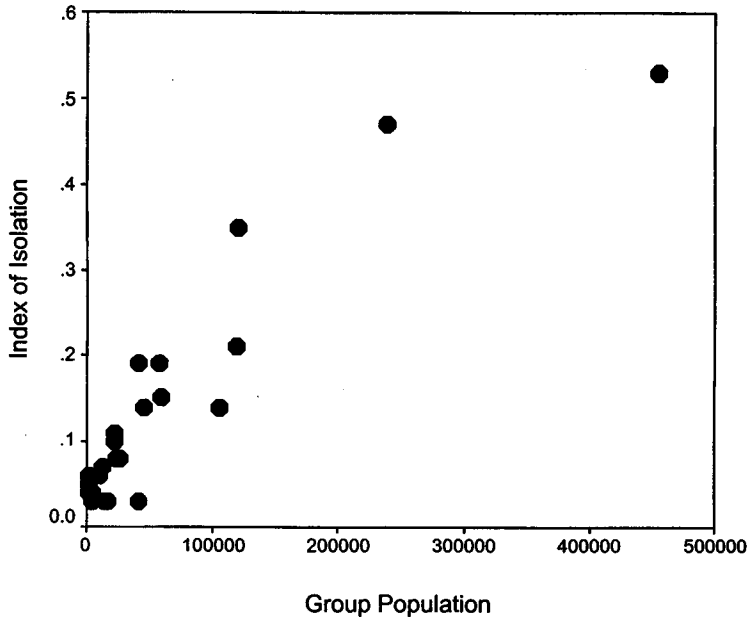


FIG. 2. Ethnic Group Size and Its Index of Isolation

size, however, although the smallest groups are the most segregated (Figure 3), which is in contrast to the pattern for the isolation index: overall small groups tend to be relatively concentrated, while large groups are more absolutely concentrated.

#### *Residential Concentration: 1. Polynesian Groups*

Table 3 gives the threshold profiles for the various Polynesian ethnic groups (that is, the New Zealand Maori and the Pacific Islanders), showing the percentages of each group's members in the various bands. In the first block, the thresholds are those for the individual groups: thus, for example, 52.9 percent of all Maori live in areas where they form less than 20 percent of the total population, 23.8 percent in areas where they form 20-29 percent of the total, 13.9 percent in areas where they form 30-39 percent, etc. To establish the percentage living in concentrations above a specified threshold you add together the bands above that threshold.

These data show that few Maori and virtually no Pacific Island groups live in areas where people with whom they share an ethnic identity are in the majority: indeed, there are no areas (whose average population is only 140 persons) in which Cook Island Maori, Niueans, Tokelauans, or Fijians form a majority of the total—and only 2.8 percent of Maori, 1.2 percent of Samoans and 0.1 percent of Tongans live in such relative exclusivity (that is, in areas with concentrations above the 50 percent threshold). There is some spatial encapsulation, therefore, but even with the largest two groups—the Maori and the Samoan—only between 1-in-5 and 1-in-4 live in areas where their co-ethnics form as many as 30 percent of the local population.

The individual groups are not substantially concentrated at any scale, therefore. But what is the situation if they are considered together rather than separately? The last two lines of the first block in Table 3 look at all Pacific Islanders (that is, all Samoans, Tongans, Cook Island Maori, Niueans, Fijians, and Tokelauans) and all Polynesians (that is, all Pacific Islanders plus the New Zealand Maori). They provide a little more evidence of concentration. Nearly 28 percent of all Pacific Islanders live



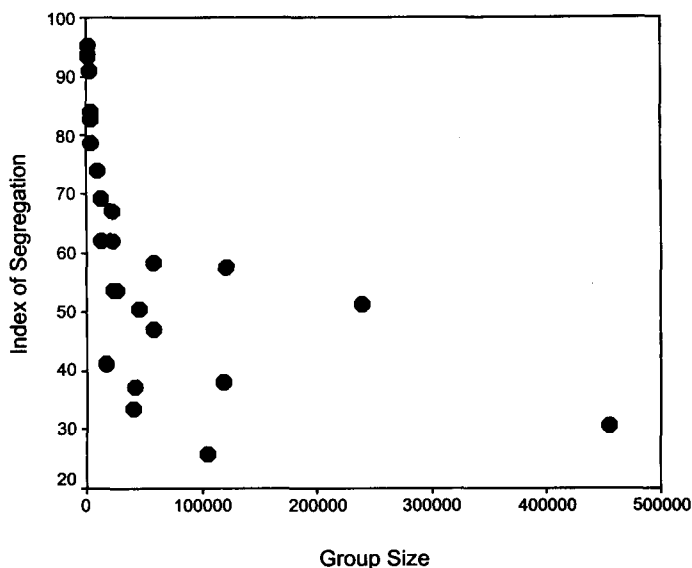


FIG. 3. Ethnic Group Size and Its Index of Segregation

TABLE 3  
Residential Concentration of Polynesian Ethnic Groups in Auckland, 1996

	Threshold Bands							
	0 19	20 29	30 39	40 49	50 59	60 69	70 79	80 99
<i>Own Group Thresholds</i>								
Maori	52.9	23.8	13.9	6.5	2.2	0.3	0.0	0.3
Samoan	55.5	23.5	13.6	6.1	1.1	0.1	0.0	0.0
Tongan	86.3	10.9	2.3	0.4	0.1	0.0	0.0	0.0
Cook Is	88.9	9.4	1.8	0.0	0.0	0.0	0.0	0.0
Niuean	97.5	2.2	0.3	0.0	0.0	0.0	0.0	0.0
Fijian	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tokelauan	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Pacific Is.	30.0	16.2	13.8	12.2	10.8	11.6	4.6	0.8
All Polynesian	20.3	11.9	11.4	10.6	11.2	10.5	8.3	15.7
<i>Pacific Island Type</i>								
Samoan	27.9	16.6	14.4	12.6	11.1	11.6	5.0	0.8
Tongan	25.1	15.8	15.5	14.4	12.6	12.1	3.7	0.9
Cook Is	30.9	14.9	12.1	10.6	10.9	14.0	5.5	1.0
Niuean	30.7	17.9	12.6	12.4	10.1	10.9	5.2	0.3
Fijian	62.1	14.5	9.9	6.6	3.1	3.1	0.7	0.1
Tokelauan	30.8	20.8	14.3	9.0	8.3	13.0	3.3	0.5
<i>Polynesian Type</i>								
Maori	28.1	13.7	12.1	10.3	10.4	9.1	6.3	9.9
Samoan	11.2	9.7	10.4	10.8	12.5	12.3	10.6	22.4
Tongan	10.9	8.6	10.2	11.4	14.1	13.0	12.3	19.6
Cook Is	12.3	10.3	9.4	10.3	10.6	10.4	10.0	26.8
Niuean	11.5	11.6	13.0	12.4	10.0	12.4	9.7	19.5
Fijian	35.8	16.5	14.7	9.2	8.0	8.4	3.1	4.3
Tokelauan	10.8	10.8	17.8	11.5	12.5	8.8	8.0	19.8
All Pacific Is	12.6	10.1	10.8	10.9	12.0	11.8	10.3	21.4

in areas where they form a majority of the population, for example, and the comparable figure for all Polynesians is 45.7—with nearly 16 percent of them living in areas where they form more than 80 percent of the total. Thus although the individual Polynesian groups do not live in separate enclaves, considerable numbers of them live in areas where Polynesians as a whole dominate the local population. Shared Polynesian rather than individual group identity appears to be the basis of residential concentration.

To inquire whether this concentration on the basis of shared identity applied equally to all groups, the other two blocks in Table 3 look at the distributions of the various groups when the thresholds are defined collectively—so that, for example, 27.9 percent of all Samoans lived in areas where Pacific Islanders formed less than 20 percent of an area's total (the second block), and 28.1 percent of them lived in areas where Polynesians as a whole formed less than 20 percent of the total (the third block). Among the Pacific Islanders, there is a clear difference between the Fijians and the remaining island groups: only 7.0 percent of Fijians lived in areas with a Pacific Island majority, compared to between 24.1 and 31.4 percent of the other five groups. The same is true when the thresholds are defined by the Polynesian percentages: less than 1-in-4 of Fijians lived in areas with a Polynesian majority, compared to over half of four of the other five groups (the exception was the Tokelau Islanders, with 49.1 percent), and nearly 36 percent of all Maori.

Ethnic concentration of Polynesians in Auckland is based on an apparent collective rather than individual group identity, therefore; over a third of the Maori and half of all the Pacific Island ethnic groups (save one of the two smallest—the Fijians) live in areas with a Polynesian majority, with around 20 percent of the five Pacific Island groups and 10 percent of the Maori living in areas where they predominate (have extreme levels of concentration)—forming 80 percent or more of the local population.

### *Residential Concentration: 2. Asian Groups*

Compared to the Polynesian ethnic groups, the Asians in Auckland are much less concentrated residentially (Table 4). Of the eight individual ethnic groups identified, only one—the Chinese—has any of its members living in areas where they form more than half of the local population (just 1.2 percent of the group total). Indeed, with the exception of the Chinese, over 90 percent of each group's members live in areas where they form less than 20 percent of the total.

Nor is there much evidence of shared “regional” identities being the basis of residential concentration for these groups. The last three rows of the first block in Table 4 show no evidence of concentration of either the South or Southeast Asian groups when the thresholds are defined jointly; only the East Asian group—in which the Chinese predominate (Table 1)—shows any evidence of residential exclusivity, which spills over into the row for all Asian ethnic groups. The final block in the table shows the distribution of the individual groups according to the “All Asian” thresholds (for example, 21.8 percent of Chinese lived in areas where Asians in total formed 20–29 percent of the population, etc.). No more than 3 percent of any group's members lived in areas where Asians formed a majority of the population, and 60–80 percent of them lived in areas where Asians formed less than 20 percent of the total. There are some small, but far from exclusive, Asian concentrations, therefore, but the general pattern is of their dispersion—in considerable contrast to the situation with Polynesian ethnic groups.

### *Residential Concentration: 3. Other Groups*

What of the other separately identified ethnic groups in Auckland—those of a largely European provenance? Table 5 shows that the three groups who identify with foreign countries (Britain and Ireland, non-British European, and Australian) do not

TABLE 4

Residential Concentration of Asian Ethnic Groups in Auckland, 1996

	0	20	30	Threshold Bands		60	70	80
	19	29	39	40 49	50 59	69	79	99
<i>Own Thresholds</i>								
Chinese	78.0	12.3	6.0	2.6	0.7	0.5	0.0	0.0
Korean	98.3	1.2	0.3	0.3	0.0	0.0	0.0	0.0
Japanese	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Indian	95.5	4.0	0.5	0.0	0.0	0.0	0.0	0.0
Sri Lankan	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Filipino	99.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Khmer	96.2	1.6	1.6	0.6	0.0	0.0	0.0	0.0
Vietnamese	98.1	1.9	0.0	0.0	0.0	0.0	0.0	0.0
All E Asian	75.3	13.3	7.1	2.5	0.8	1.0	0.0	0.0
All S Asian	94.8	4.7	0.5	0.0	0.0	0.0	0.0	0.0
All SE Asian	98.6	1.0	0.1	0.2	0.0	0.0	0.0	0.0
<i>All Asian Thresholds</i>								
Chinese	58.4	21.8	10.5	6.4	1.7	1.3	0.0	0.0
Korean	71.2	18.3	6.1	3.3	0.2	0.9	0.0	0.0
Japanese	79.1	12.3	4.8	2.9	0.3	0.7	0.0	0.0
Indian	70.0	20.1	6.2	3.0	0.6	0.2	0.0	0.0
Sri Lankan	62.3	23.7	8.8	4.6	0.4	0.3	0.0	0.0
Filipino	75.9	16.2	4.4	3.1	0.5	0.0	0.0	0.0
Khmer	70.9	21.2	4.2	2.6	0.3	0.7	0.0	0.0
Vietnamese	71.9	21.7	4.2	1.4	0.6	0.2	0.0	0.0
E Asian	61.7	20.6	9.4	5.7	1.4	1.2	0.0	0.0
S Asian	69.3	20.4	6.4	3.1	0.6	0.2	0.0	0.0
SE Asian	76.9	15.9	3.9	2.6	0.3	0.3	0.0	0.0
All Asian	66.1	19.8	7.7	4.5	1.0	0.8	0.0	0.0

TABLE 5

Residential Concentration of Other Ethnic Groups in Auckland, 1996

	0	20	30	Threshold Bands		60	70	80
	19	29	39	40 49	50 59	69	79	99
British and Irish	83.8	15.0	1.1	0.0	0.0	0.0	0.0	0.0
NB European	92.1	7.7	0.3	0.0	0.0	0.0	0.0	0.0
Australian	99.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0
NZ Europeans	2.6	4.4	8.8	16.4	31.0	28.0	7.8	0.9

live in separate concentrations: even more so than the Asian ethnic groups, they live in areas where they form less than 20 percent of the total population. New Zealand Europeans, on the other hand, are residentially very concentrated. Just over two-thirds of them (67.3 percent) lived in areas where they formed a majority of the total, and only 7 percent where they formed a small minority—less than 20 percent: members of the dominant group in the local society are the most likely to live in residential isolation from members of other ethnic groups.

### *Summary*

The overall picture of residential concentration in Auckland provided by the threshold data comprises four main elements:

1. There is substantial concentration of Polynesian ethnic groups (with the partial exception of the Fijians); the majority of Pacific Islanders and a substantial minority (more than one-third) of Maori live in areas where Polynesians as a group form a majority of the local population.
2. There is very little concentration of members of Asian ethnic groups—either individually or collectively; with the (slightly) partial exception of the Chinese, the great majority of these live in areas where they form only a small minority of the local population. Whereas a substantial proportion of the Polynesians are spatially encapsulated, very few of the Asians are.
3. None of Auckland's residents who identify with either a European country or Australia live in anything remotely resembling an "ethnic enclave"; virtually all of them lived in areas dominated by other groups.
4. There is substantial concentration of New Zealand Europeans, the majority of whom live in areas where they dominate.

One possibility as yet unexplored is that there is joint concentration of members of the two main sets of ethnic groups—the Polynesians and Asian; if this was the case, it would imply (though clearly no more) that the main reason for their concentration was economic disadvantage, since if it were cultural identity, they would live apart, whatever their economic situations. Table 6 explores this. The threshold concentrations in this case are the combined percentages for the Polynesian and Asian ethnic groups so that, for example, 14.4 percent of all Maori live in areas where Polynesians and Asians together form less than 20 percent of the population, etc. For the Polynesians, this indicates a significant increase in the percentages living in areas with ethnic majorities: 68 percent of Pacific Islanders lived in areas where more than half the residents were either Polynesian or Asian, for example, compared to 55 percent when the threshold was that for Polynesians alone (compare Tables 6 and 3).

**TABLE 6**  
Residential Concentration of Polynesian and Asian Ethnic Groups in Auckland, 1996—thresholds defined by their joint populations

	Threshold Bands							
	0 19	20 29	30 39	40 49	50 59	60 69	70 79	80 99
Maori	14.4	13.4	14.1	11.9	12.0	11.6	9.5	13.0
Pacific Is	4.8	7.0	9.9	9.7	12.5	14.4	14.0	27.5
Polynesian	9.5	10.2	12.0	10.8	12.3	13.0	11.8	20.4
E Asian	21.2	26.1	10.6	13.2	8.5	6.0	2.9	1.5
S Asian	11.0	19.7	20.0	15.1	13.3	10.8	6.3	3.1
SE Asian	12.1	19.0	16.8	13.3	10.6	12.3	9.6	6.1
Asian	17.4	23.3	19.9	13.7	10.2	8.2	4.8	2.6

Whereas the differences between the patterns in Tables 3 and 6 are relatively slight, those between Tables 4 and 6 are much more substantial, at least with regard to the Asian ethnic groups. Over one-third of South and Southeast Asians lived in areas where Asians and Polynesians together were in a majority, compared to less than 1 percent when Asians were in a majority on their own. The smaller figure for East Asians (and thus for Asians as a whole) reflects the relative absence of Koreans and Japanese from these areas of Polynesian/Asian majorities (only 8.5 and 10.3 percent respectively living in areas where the two groupings together form a majority); 21.7 percent of Chinese lived in the areas with joint majorities.

Overall, the patterns in Table 6 suggest a clear divide within the Asian ethnic groups. Those who are economically disadvantaged tend to live in the same areas as the economically disadvantaged Polynesians; those who are not are dispersed throughout the city—with the Koreans and Japanese, as the more successful economically among the Asian groups, the most dispersed.

#### EXPOSURE TO OTHERS

A further use for the method of measuring residential concentration introduced here is to assess the degree to which members of ethnic groups are exposed to others in the population through shared residential areas. This is done by setting the distribution of one group relative to the thresholds for another group—and is illustrated here with two examples.

Table 7 shows the degree of exposure to New Zealand Europeans (that is, their "host society") among members of the Polynesian and Asian ethnic groups. The thresholds refer to the former group, so that, for example, 25.6 percent of Maori lived in areas where New Zealand Europeans formed less than 20 percent of the local population, 14.6 percent where they formed 20–29 percent, etc. The first half of the table shows that the great majority of most Polynesian groups lived in areas where New

TABLE 7  
Exposure to New Zealand Europeans: Polynesian and Asian Ethnic Groups in Auckland, 1996

	Threshold Bands							
	0 19	20 29	30 39	40 49	50 59	60 69	70 79	80 99
Maori	25.6	14.6	15.3	16.0	17.3	9.4	1.7	0.1
Samoan	47.4	16.6	13.5	10.9	8.3	2.9	0.3	0.0
Tongan	49.6	17.7	13.4	8.8	7.3	2.7	0.4	0.0
Cook Is	49.1	14.5	12.4	10.9	8.8	3.7	0.5	0.0
Niuean	42.4	16.7	16.3	12.4	8.7	2.9	0.4	0.0
Tokelauan	38.6	16.8	21.1	11.0	9.8	2.5	0.3	0.0
Fijian	18.6	13.8	15.9	18.8	20.7	10.0	2.1	0.1
Pacific Island	45.9	16.3	13.8	11.1	8.9	3.4	0.5	0.0
Polynesian	35.9	15.5	14.6	13.5	13.0	6.4	1.1	0.0
Chinese	6.4	8.8	16.8	24.0	28.4	13.2	2.2	0.1
Korean	2.2	4.3	10.1	23.3	39.0	18.0	3.0	0.1
Japanese	2.7	6.0	11.6	20.6	30.3	24.1	4.5	0.2
Indian	12.7	13.0	19.4	22.1	22.3	9.5	0.9	0.1
Sri Lankan	4.6	10.9	21.4	27.7	23.7	9.8	1.9	0.0
Filipino	7.8	10.4	20.1	24.7	25.1	10.7	1.1	0.0
Khmer	31.8	26.4	13.8	13.2	11.6	3.1	0.3	0.0
Vietnamese	41.6	18.6	11.0	13.5	11.3	3.7	0.2	0.0
South Asian	12.0	12.8	19.6	22.6	22.5	9.5	1.0	0.1
East Asian	5.5	7.9	15.4	23.7	30.2	14.6	2.5	0.1
S E Asian	21.8	16.3	16.4	19.2	18.5	7.1	0.7	0.0
All Asian	8.8	10.1	16.7	23.0	27.0	12.5	1.9	0.1

Zealand Europeans formed a small minority (<20 percent) of the population only. The exceptions were the Fijians, one-third of whom lived in areas where New Zealand Europeans were in a majority, and the Maori, whose percentage living in areas with few New Zealand Europeans (25.6) was similar to that for areas where they were in a majority (28.5). Overall, however, most Polynesians lived in areas where members of their "host society" were in a small minority, indicating low probabilities of frequent meetings between the two groups in their local areas.

The second part of Table 7 shows a clear difference between the pattern of exposure for Polynesians, on one hand, and Asians on the other. Less than 10 percent of all Asians live in areas where New Zealand Europeans form 20 percent of the local population or less, and over 40 percent of them lived in areas with a New Zealand European majority. Compared to the Polynesians, many more Asians shared small residential areas with their "hosts," although there were variations among the Asian communities. Large proportions of Southeast Asians (almost entirely the Khmer and Vietnamese rather than the Filipino) lived in areas that were less than 30 percent New Zealand European, for example, and only one-quarter of them lived in areas with New Zealand European majorities.

Finally, Table 8 shows that this pattern of cross-group exposure is asymmetric: whereas many Asians and a substantial number of Polynesians live in areas where New Zealand Europeans dominate and so probably have considerable informal contact with members of the "host society," very few members of that society (or, indeed, of the groups closest to it culturally and economically—the British and Irish, non-British Europeans, and Australians) live in close proximity to large numbers of Polynesians and Asians. Using the thresholds for five groups—Maori, Pacific Islands,

TABLE 8  
Exposure to Polynesian and Asian Ethnic Groups in Auckland, 1996

	Threshold Bands							
	0 19	20 29	30 39	40 49	50 59	60 69	70 79	80 99
<i>British and Irish</i>								
Maori	90.7	6.6	2.0	0.6	0.1	0.0	0.0	0.0
Pacific Islands	91.4	4.8	2.1	1.0	0.4	0.3	0.1	0.0
Polynesian	74.5	11.4	6.2	3.4	2.3	1.2	0.5	0.5
Asian	90.2	7.1	1.8	0.7	0.1	0.0	0.0	0.0
Polynesian/Asian	47.2	22.9	13.9	7.1	4.4	2.7	1.2	0.7
<i>Non-British European</i>								
Maori	91.1	6.4	1.8	0.6	0.1	0.0	0.0	0.0
Pacific Islands	90.3	5.9	2.2	1.0	0.4	0.2	0.0	0.0
Polynesian	72.4	13.2	7.1	4.1	2.1	1.2	0.5	0.3
Asian	88.9	7.8	2.1	0.9	0.2	0.0	0.0	0.0
Polynesian/Asian	44.4	23.0	15.0	7.8	5.0	2.7	1.3	0.0
<i>Australian</i>								
Maori	88.8	7.6	2.4	1.0	0.2	0.0	0.0	0.0
Pacific Islands	89.0	6.0	2.7	1.2	0.7	0.4	0.0	0.0
Polynesian	70.9	12.1	6.9	4.3	2.6	1.8	0.8	0.6
Asian	89.6	7.5	2.0	0.8	0.1	0.1	0.0	0.0
Polynesian/Asian	44.1	21.7	15.0	7.8	5.6	3.2	1.5	1.1
<i>New Zealand Europeans</i>								
Maori	89.6	7.0	2.3	0.8	0.2	0.0	0.0	0.0
Pacific Islands	90.5	5.4	2.3	1.1	0.5	0.2	0.0	0.0
Polynesian	72.7	11.8	6.6	3.8	2.6	1.5	0.6	0.4
Asian	89.8	7.3	1.9	0.8	0.1	0.0	0.0	0.0
Polynesian/Asian	45.3	22.8	14.3	7.6	4.9	3.0	1.4	0.7

Polynesian, Asian, and Polynesian plus Asian (so that, for example, 88.8 percent of Australians lived where Maori formed less than 20 percent of the population and 89.6 percent where Asians formed that proportion)—each block shows that the great majority of New Zealand Europeans, British, other Europeans, and Australians lived in areas where members of the Polynesian and Asian ethnic groups formed only a small proportion of their local population—with, as a consequence, very few living in areas where Polynesians and Asians were in a majority. The main difference was between the thresholds for Polynesians and Asians together and the other four groups. Treating all Polynesians and Asians as one ethnic “community” results in about 10 percent of New Zealand Europeans, British/Irish, non-British Europeans and Australians living in areas where the other ethnic groups were in a majority. Nevertheless, the main distinction remains clear: whereas considerable numbers of Asian ethnic group members in Auckland, and not insignificant numbers of Polynesians, lived in areas where New Zealand Europeans dominated, most New Zealand Europeans and associated groups lived in relative isolation from Polynesians and Asians.

## CONCLUSIONS

This paper has introduced an alternative procedure for analyzing intraurban ethnic residential patterns. Numerous indices of such patterns have been proposed, measuring different aspects of a multidimensional concept. We have suggested that measures for three of these dimensions relate to relative unimportant aspects of the geography of ethnic groups, and that the standard measures for the other two—the indices of segregation and isolation—are both poor indicators of the patterns suggested by theories of residential differentiation, because they refer to citywide averages only and, being relative rather than absolute measures, are not readily comparable across time and space.

Our measure of residential concentration—the degree of spatial encapsulation and sharing of residential space, at various threshold levels—has been illustrated with fine-scale spatial data for the Auckland urban region in 1996. Comparison with the “standard” measures is not easy because our procedure produces a profile for each ethnic group comparison rather than a single index. However, abstracting one index from that profile—the percentage living in areas where the ethnic group forms more than 20 percent of the area population—we find a much closer relationship with the index of isolation (Figure 4: the  $r^2$  is 0.97) than with the index of segregation (Figure 5:  $r^2$  0.23). The threshold analyses and the index of isolation are measures of absolute concentration, and the index of segregation is a measure of relative concentration. This suggests that the index of isolation provides a useful summary index of residential concentration—but a single index cannot adequately display either the profile for any group or the complex differences between group profiles. It is actually a better measure of concentration than it is of isolation (Holloway et al. 1999), which is unfortunate given its name. Even when we restrict our analyses to those at the summary level the detail provided by our procedure provides a much richer appreciation of the city’s ethnic geography, and is the source of many more substantive questions than the single index. That detail can be developed, mapped, and subjected to spatial analysis if we proceed into other threshold analysis methodology developed elsewhere (Poulsen and Johnston 2000a, 2000b; Poulsen, Johnston, and Forrest 2001).

People’s local context, and their manipulation of local space, remain central components of the making and remaking of their individual and group identities, as well as substantial influences on their social, cultural, and economic well-being and political participation. Identifying the nature of those contexts in mass societies calls for quantitative analyses, not as ends in themselves (though their descriptive value alone is considerable) but as elements of understanding complex geographies. The proce-

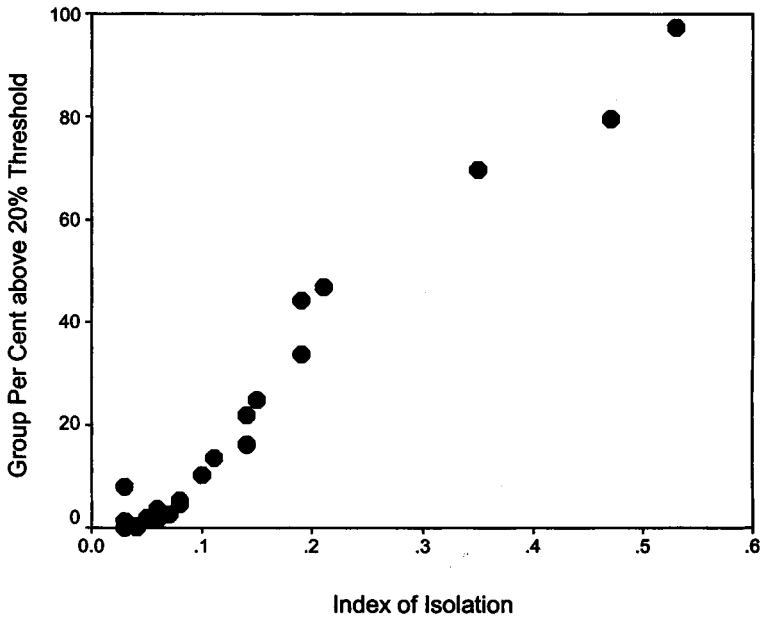


FIG. 4. The Index of Isolation and Group Percent above the 20 Percent Threshold

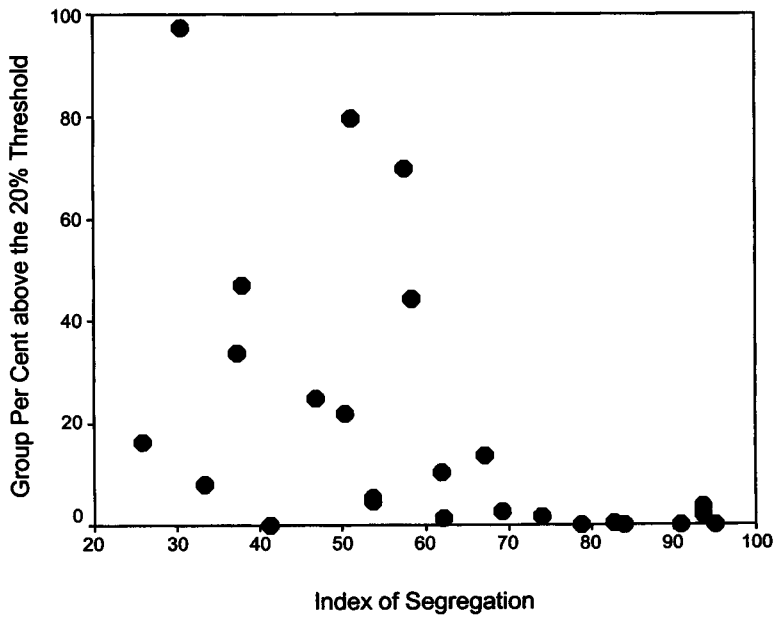


FIG. 5. The Index of Segregation and Group Percent above the 20 Percent Threshold



dure described here has been presented as providing greater insights to patterns of residential segregation than is the case with traditional measures. It identifies many intriguing avenues for research, such as the differences in concentration between the Polynesian and Asian ethnic groups, and the intragroup differences (between the Fijians and other Pacific Island groups, for example, and between the Koreans and Japanese and other Asian groups—especially the Khmer and Vietnamese).

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