

Rainbow nation, skewed spectrum: immigrant residential segregation in a post-apartheid South African city

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Please note that this is a draft version of the paper. Comments are welcome and should be directed to the author via email: gayatri_singh@brown.edu

1. Background and aim of the study:

An inquiry into the lives and experiences of migrant populations compels us to confront the relationship between distribution of individuals in space and the spatial dimensions of social processes. While the importance of residential locations for sociologically relevant outcomes has been prominently recognized, a systematic understanding of spatial mechanisms underlying human behavior has only begun to be explored in sociology in the past couple of decades. It is true that Chicago School theorists as far back as 1920s and 1930s, viewed human behavior to be shaped by social structures and the urban ecological context. But while such studies had an inherently spatial dimension, the focus was on place characteristics and not on spatial configurations of groups or individuals that may be reflective of the underlying social interactions and hierarchies among groups.

Over the years, the discipline of sociology has advanced a more explicit engagement with the spatial aspects of population distribution based on socio-demographic characteristics and related inequalities in life outcomes of social groups. Indeed, an exploration of spatial processes is gaining preponderance in sociology of inequality (Tickmayer, 2000). Simultaneously, advances in spatial software have opened up new avenues for understanding associations between uneven spatial distributions of groups and socio-economic dimensions such as income, education, age, race, immigrant nationality etc. across a range of social science disciplines. Both qualitative and quantitative approaches in sociology are paying increased attention to spatial dimensions of social relations either as a point of departure for further investigation or as an explanatory factor for the social phenomenon being studied. Among these, studies of residential and work segregation based on membership to a racial or an ethnic group have been most popular (see for instance, Zorlu and Mulder, 2008; White et al, 2005; Logan et al, 2002; White et al, 1994; Massey and Denton, 1985 to name a few).

But even though the analysis of racial and ethnic segregation has become methodologically more refined, the bulk of this work has remained focused on the United States (examples include, South et al., 2005; Quillian, 2002; Cutler et al., 1999; Borjas, 1998; South and Crowder, 1998; Massey et al., 1994; White et al 1986). Comparative analyses, where available, have been predominantly restricted to urban systems of immigrant receiving western nations (see Johnston et al, 2007 for a recent comparative analysis of Australia, Canada, New Zealand, the United Kingdom and United States). Little attention has been paid to the urban ecology of ethnic residential segregation in

developing countries. This is not only an empirical limitation in the cumulative research on segregation but also reflects a level of theoretical impoverishment within the urban segregation literature. Given that the origin of the theories on ethnic segregation lies in the experience of Western nations (particularly United States) at the time their economies were experiencing unprecedented industrialization and growth (Zorlu and Mulder, 2007), it is legitimate to question their applicability to the experience of developing countries. This is especially pertinent for African nations with a history of late independence from colonial rule and widespread geographical segregation of majority Black populations in their own nations.

Segregation in colonized nations such as South Africa, Zimbabwe, Namibia and Kenya was “a policy tool of limiting people's freedom of choice to live where they wished; for the sole purpose of promoting social identities for political purposes” (Akumu and Olima, 2006). Such artificial spatial constraints invariably delayed the process of urbanization that can be seen in several African cities, a most obvious of which can be found in South Africa. However, as Huchzermeyer (2002) demonstrates for South Africa, the post colonial playing field is not entirely level in terms of access to urban residence. Rather, market processes seem to be taking over the role on previous governments in maintaining and perpetuating residential segregation. Macoloo (1998) notes rising levels of inequality in Kenyan cities, with the previously designated White areas still enjoying increasing levels of affluence. Further, post-colonial governments in Africa inherited the colonial urban planning and administrative systems with little attention to planning for increased migration into the cities (Tacoli et al 2008 in Martine et al 2008). It should then not be surprising that such historical experiences that shape current administrative policies and are likely to shape emerging forms of urban segregation in the new African cities. This is especially likely to be the case in South Africa where a substantial number of urbanizing citizens previously confined to rural areas find themselves (or perceive themselves) competing for limited urban space and economic opportunities with the increasing immigrants to the cities.

South African apartheid government’s obsession with race based social isolation (i.e. institutional segregation)¹ based on corresponding spatial engineering (i.e. territorial segregation)¹ of race groups resulted in sustained residential segregation between Blacks and Whites in the cities. In principle, post-1994 democratic elections ushered in an era of equality of access to residential spaces for all South African citizens. But deep rooted and persistent socio-economic inequalities correspond to years of differential racial advantage, historical processes of community formation in segregated groups, continued schisms based on tribal affinities within Black South Africans, continued high level of unemployment, and low educational attainments in Black and Coloured populations. These are some of the factors that continue to retard the realization of widespread spatial residential assimilation across race groups within the South African citizenry. At the same time, the urban socialscape has been made even more complex with increased immigration into urban areas from surrounding countries on the continent. Immigrants to South Africa not only belong to a diversity of ethnicities and language groups but also

¹ Borrowing from Mamdani, M. 1996. *Citizen and Subject*. Princeton Press.

have a variety of reasons for being in the country. The reasons range from economic opportunities to forced migration but distinctions between these categories are often blurred in reality. Diversity in the socioeconomic and demographic characteristics between immigrant groups is likely to be expressed in immigrants' successful adaptation, adjustment and assimilation within the host society. Additionally, the presence of substantial internal migration of South Africans from small towns and rural areas to big cities may also determine the dynamics of immigrant reception in the host community. Given such background, this paper attempts to contribute to the understanding of segregation in a non-western context by analyzing multi-group migrant residential segregation patterns in Johannesburg, a metropolitan city of South Africa. It focuses on the settlement patterns of two immigrant groups, namely Congolese and Zimbabweans with respect to South African internal migrants in inner city Johannesburg using cross-sectional survey data collected in 2007 in the inner city of Johannesburg, which employed a random spatial sampling strategy (some details of the survey sampling strategy and the implications of the nature of this data for an analysis of residential segregation are discussed in later sections²).

2. Theoretical framework:

2.1 Importance of studying residential segregation:

Residential locations are sociologically important as they are the sites where social interaction and civic engagement among groups takes places. Despairing the presence of "color line" separating Blacks and Whites in United States at the turn of the 19th Century, Du Bois (1903:165) gave a central place to the "physical proximity of home and dwelling places, the way in which neighborhoods group themselves and the contiguity of neighborhoods" as one of the "main lines of action and communication" between individuals. An underlying assumption is that social distance is reflected in spatial patterns of residential settlement (Park, 1952). How individuals are placed in relation to each other determines the nature of social interactions and hierarchies of advantage in a society. For instance, one of the markers of the salience of strong group identification in a population is the nature of social interactions among individuals who share space and who share access to certain resources. This nature of social interactions is also symbolic of power relations at the societal level.

But the actual process of social interaction inherent in social networks may be elusive to measurement. The question then becomes whether spatial configurations of community settlements might be able to serve as a proxy for understanding, at the very least, the presence or absence of social interaction between groups? Such a conjecture forms the basis of studies of residential segregation, including this work. However, White (1983) warns us that this may not always be the case as the sociological aspect of segregation (i.e an absence of interaction among certain social groups) does not necessitate a geographical one (i.e. an unevenness in the distribution of social groups across physical

² A detailed exposition of the methodology is available in the working paper titled "Creating a frame: random sampling in non-homogeneously distributed urban migrant communities in South Africa" by Singh et al, presented at PAA 2008 New Orleans.

space) and vice versa. Groups that have a high social distance (lower vs. upper castes or classes for instance), may be found to live in the same neighborhood but not interacting with each other. For example, domestic workers living and working in the houses of wealthy employers may not engage with them in the social sphere. Yet, argues White (1983), “geographical and sociological segregation are probably correlated” and therefore segregation indices can be used to make inferences about the nature of the community structure. Even if people don’t actively engage with each other, their affinity is likely to have beneficial or negative impacts on one’s social life (such as an effect on house values). Of course, it should be kept in mind that this micro perspective on residential space interactions only presents a part of the whole picture. Arrays of institutions such as church, school, workplace etc that act as points of socialization are inter-woven in the fabric of individuals’ lives. Still, the neighborhood context may itself determine the accessibility to such institutions and thus play an important role in further determining the opportunities for socio-economic attainment and in the case of migrants, the pace and level of adaptation to the host society.

2.2. Sociological accounts explaining residential segregation:

The literature on residential segregation is substantial and several explanations have been offered for the existence and persistence of segregation at the neighborhood level. Although the scope of this work does not lend itself to an extensive examination of the reasons for the patterns of segregation that may be found in the analysis of survey data here, it is still useful to briefly review the literature from which hypothesis may be drawn. This exercise is also important to understand the extent of the applicability of these theoretical perspectives predominantly based on trends and patterns of immigrant segregation in American cities for the context of this study.

The myriad of studies on residential segregation can be classified under two overarching theoretical models, namely *spatial assimilation* and *place stratification*. For the spatial assimilation model, residential integration with host population for individuals of immigrant minorities occurs with increased socio-economic gains. In other words, immigrant ethnic groups become less isolated with increases in their socio-economic status over time. The place stratification model is less optimistic about objective socioeconomic gains and claims that residential mobility of immigrant minorities will be hampered despite socioeconomic gains due to racial discrimination. Despite focusing on different causes of immigrant segregation, studies applying both models are in agreement that at least in the American case, race is a key factor in determining the level of segregation in a group, net of other factors. Immigrants of Black phenotype fare the worst (including Hispanics whose skin color is Black) versus those who are fair skinned (Massey and Denton, 1989).

2.2.1 Spatial Assimilation Model:

The spatial assimilation model originally came about as a framework to explain the settlement patterns of economic migrants to United States, mostly from Europe, in the early 19th Century. With a focus on residential outcomes understood as being indicative

of social mixing between host and immigrant groups, a ‘melting pot’ model of immigrant adaptation was put forth to link social distance between groups to the extent of their spatial assimilation with host populations (White 1994). Based on Burgess’s (1925) ecological model of the city, a simplified manner understanding the model would be to imagine a city where the new arrivals settle down in inner core of cities but stay ethnically segregated from the host populations as well as other immigrant groups. As time passes by, these groups enhance their socio-economic status and begin to intermingle into the host community and establish co-residence with the hosts. The notion that gains in social mobility are converted into better quality housing and increased residence in areas inhabited by the host group, has been utilized by many studies of segregation that define social mobility in terms of enhancement in education, income, and occupational status (Massey & Denton, 1985). It is difficult to say where residential intermixing would fit within the trajectory and causal ordering of full assimilation with the host communities but Massey and Mullan (1984) suggest that it should be seen as an important intermediary step.

Spatial assimilation also involves the dynamic of acculturation, which could include the accumulation of time in the host country, fluency in the language of majority and adoption of lifestyles resembling the host population. In this sense, spatial assimilation involves eroding of the presumed class and status boundaries that exist between immigrants and host populations. The former is likely to be easier to accomplish if linked to socio-economic status whereas the latter may be a longer term, predominantly intergenerational pursuit. Moreover, given that different immigrant groups have different human, social and cultural capital, the process of assimilation may not follow the same trajectory for all groups. Based on this insight, scholars of segregation have come up with the segmented assimilation hypothesis suggesting that the pace and patterns of different ethnic groups is dependent upon their human and financial capital and proficiency in the dominant language (South et al, 2005)

However, the continued segregation of African Americans and lower residential outcomes (in terms of living conditions, crime etc.) despite socio-economic gains has compelled researchers to look into other explanations for residential segregation. For example, one troubling finding by Alba et al (2000) in the United States context is that Black homeowners fare worse than their renting counterparts in terms of their residential outcomes. They find that although middle class and affluent Black homeowners reside in neighborhoods with more Whites than their co-ethnics living in inner city areas, their White neighbors have a generally lower socioeconomic status than them (Alba et al 2000). These trends contradict the assumptions of the spatial assimilation model and signal a persisting racial stratification in socio-economic gains in the American society. To better explain these differences, researchers have put forth explanations that fall under the place stratification model.

2.2.2 Place stratification model:

This model postulates that “[r]acial/ethnic minorities are sorted out by place according to their group’s relative standing in the society, [limiting] the ability of even the socially mobile members to reside in the same communities as comparable Whites” (Alba and

Logan 1993:1391). Logan (1978) talks about a “hierarchy of places” associated with a collection of available opportunities for people residing in them and therefore instrumental in determining their life chances. Beyond this point of departure, scholars differ with regards to the mechanisms that explain persistence of race and place stratification over time. One set of arguments favor a theory of neighborhood racial preferences (Clark, 1992, 2009; Zang, 2004) while the other set posits a key role to institutional factors, particularly discriminatory practices in the real estate and housing market that ensure a housing advantage for Whites (Massey and Denton, 1993; Logan et al 1996).

Clark and Fossett (2008) argue that “mere tolerance and the absence of virulent housing discrimination will not produce integration under prevailing patterns of ethnic preference, at least, not in the short run”. Segregation is seen as an outcome of “a simple, natural ethno-centricism” (Charles, 2003) rather than a calculated strategizing to preserve self-group advantage. Clark (1992) argues that all groups have strong desires for in-group residence that determines neighborhood composition rather than out-group hostility. Schelling’s selection and segregation model based on agent vision and preference schedules forms the basis for several neighborhood racial preference models (Clark and Fossett, 2008). Zang (2004:548) gives mathematical explanations to show that homogeneity in neighbors or segregation “tends to emerge and persist in the long run regardless of the initial state”. This is due to a relational process of dynamic residential sorting, described by Clark and Fossett (2008: 4113) based on simulated model of residential outcomes based on agent preferences:

When a household enters a neighborhood, the neighborhood becomes more attractive to members of the household’s own group and less attractive to members of other groups. Unless most households are strongly averse to majority status—and surveys indicate this is not the case, local neighborhoods will drift toward ethnic homogeneity. The resulting neighborhood structure is more segregated than most individual households would find “ideal.”

Clark and Fossett (2008) use the data on reported ideal neighborhood preference from Metropolitan Study of Urban Inequality (MSUI) for four race/ethnic groups in Los Angeles to come to these conclusions. But interestingly, the same data was used by Krysan and Farley (2002) who carried out an examination of open-ended answers of Black respondents to understand their preferences for integration. They find that desires to improve race relations and/or a belief in the principle of racial integration drive Black respondents’ preferences for integration. At the same time, the desires for substantial co-ethnic presence are spurred by fears of facing discrimination and White hostility in majority White neighborhoods (Krysan and Farley, 2002). In these explanations, the authors don’t find any support for race preference hypothesis. Limited space here prevents an in-depth engagement with each of these explanations but it is worth pointing out another explanation that downplays the role of systematic institutional forces in segregation, namely, the race proxy hypothesis (Charles, 2000). Here residential preferences of Whites are seen as being determined by neighborhood quality and social class. The proponents then argue that Black neighborhoods are associated with

undesirable characteristics and it is this association that creates an aversion to Blacks as neighbors and not race per say.

A criticism of these accounts emphasizing preferences or seeing race as a neutral proxy, is that they tend to ignore the macro level dynamics that may be operating simultaneously to affect the neighborhood outcomes in significant ways. Structural accounts of reasons for segregation object what they consider a-political interpretations of persistent race based stratification in the United States. Instead they point to the role of institutional practices in creating and maintaining “systematic, institutionalized racial discrimination” (Massey and Denton, 1993). Cutler et al (1999) point to the housing market discrimination that operates more in more subtle ways than previously formalized and state legitimized forms of racial discrimination in the United States. Examining the segregation in American cities from 1890 to 1990 they find that by the end of this period the legal barriers enforcing segregation had been replaced by other decentralized (and difficult to discern) forms of racism. For instance, in they find that in the latter periods Whites paid more to live in predominantly White neighborhoods.

Squires and O’Conner (2001) show how urban spaces come to embody and reproduce social hierarchies and inequalities. Using census tract level aggregated data on amount and location of small business loans by commercial banks in the Milwaukee metropolitan statistical area (MSA) is examined to demonstrate how spatial patterning of poverty is itself detrimental to the economic development of the locations where poverty is concentrated. Given that spatial patterns of poverty correlate well with the residential locations that have a high percentage Black population, the underdevelopment trap becomes a function of disadvantage by class as well as race. The authors find that in the Milwaukee MSA, small business lending continued to be concentrated in upper-income and predominantly White communities between 1996 and 1999. Racial gaps in lending activity by neighborhood composition were also found to have worsened over time. Locational inequalities therefore become a trap for further development, thus perpetuating social disadvantage for the inhabiting communities.

While spatial assimilation hypothesis forms the backbone of the segregation analysis, the mechanisms of segregation specified by the place stratification model have gained more preponderance in the recent years (Charles, 2003). However, the results arising from the plethora of segregation studies point to a mixed bag of claims eliciting support for both theories for different minority groups. An important test of the theoretical claims made above can come from applying them to analyze the circumstances of rapidly urbanizing societies in transition such as South Africa. This paper is one such step to examine such applicability and expose critical myopias that may exist when theoretical frameworks are made to travel to a developing country context.

2.3 Applicability to the South African Case:

South Africa has had a unique history of human migration. The need for mining capital in South Africa at the end of the 19th Century under colonialism became the first impetus for the emergence of a migration regime to be further reinforced by post World War II

apartheid government's social and spatial structuring policies. These racially based policies were developed as mechanisms of spatial and structural population control aimed at controlling the movement of non-White, populations³ (see Posel, 1997 for a detailed analysis). By 1950, the apartheid project of segregation had achieved its aim of creating ethnically homogeneous rural areas for Black populations on the pretext of granting them governing autonomy while achieving the purpose of keeping Black African population out of White populated cities. Limited rights for land ownership for black African farmers further resulted in extreme poverty within the overcrowded rural concentration of the black African population leading to "massive migration of able-bodied males to mining, industrial, and urban centers" (Ndegwa et al., 2004). Such migration of Black workers served to form the class of cheapest and most exploitative labor servicing gold and other mines, doing menial work in White households and post-World War II industrial manufacturing. A simultaneous lack settlement rights in the urban areas for these migrants led a persisting impermanence in the urbanization process of the South African black population.

It is noteworthy that the time of 2001 Census, of the 3,225,816 people in the city of Johannesburg, 1,136,851 people (35.2 percent of the population) were recorded as internal migrants. More recently, alongside internal migration, there has been an increase in the levels of international migration into South African cities, particularly in the inner cities of gateway metropolitans like Johannesburg. In 2001, the Department of Home Affairs (DHA) figures in 2001 showed the presence of approximately 23,465 refugees and asylum seekers in the country. By 2005, this number had increased to 169,809 any by 2007 it was 207,601, recording more than eight fold increase between 2001 and 2007 (Landau and Kabwe-Segatti, 2009). Beyond this a substantial number of undocumented migrants reside in the country but no reliable statistics on their numbers are available. Claims about the presents of 2 to 5 million undocumented migrants, particularly from Zimbabwe, are made by Home Affairs officials but the reliability of these figures remains highly unquestionable (Landau and Kabwe-Segatti, 2009).

As a result, contemporary urban migration patterns in South Africa may be conceptualized in terms of internal migration vs. international migration and/or labor migration vs. forced migration. In reality, none of these categories is clear cut. The residential area of the inner city Johannesburg has come to be dominated by African immigrants and South African rural migrants (although a large portion of internal migrants live on the city periphery). Presence of migrants differentiated by purpose, having varied legal status (within the same community as well as across communities) and competing for the same set of resources in a setting that presents high economic risks and insecurities, requires a careful examination to disaggregate the forces determining residential patterning.

³ Groups were categorized as African (referred to as Black); Coloured (a heterogeneous group of people with racially mixed ancestry); Asian (referred to as Indian) and White (of European origin). Black African people were given the least privileges (if any) while White populations enjoyed the most benefits of the apartheid system.

In such a setting, usefulness of the *spatial assimilation model* is not immediately apparent, where immigrants include not only economic migrants (documented and undocumented) but also asylum seekers and refugees who are subject to diverse sets of legal protections and privileges. Further, the majority population in South Africa is Black African and racially (in so far as it is defined in terms of phenotype) the same as the major immigrant groups, in this case, Zimbabweans and Congolese. There are of course important ethnic and language differences among the two immigrant groups that are likely to play an important role in residential outcomes, especially if the version of *place stratification* theory stipulating a natural tendency towards ethno-centrism is taken into account.

However, economic gains remain concentrated within the minority White population while unemployment reigns high at about 25% (Statistics South Africa 2006), which is considered to be a very conservative estimate. In this scenario of low socioeconomic status of most Black South Africans, immigrants would have to compete with the most populous host group for social mobility over time, quite unlike to the situation in United States. Of course this is not to imply that the playing field is level. Apart from the advantage that comes from having long standing social capital, another advantage for Black South African citizens is the availability of social welfare and government's commitment to increasing social housing for Black South African citizens in urban areas. Added to this are the xenophobic sentiments experienced by immigrants at the institutional level, which mediate their access to resources and employment opportunities. These dynamics suggest that perhaps a version of *place stratification model* explaining residential settlement patterns of immigrants might make more sense in the South African case. An important question is whether residential gains over time should be seen in terms of immigrants intermingling with Black South Africans or with the existing White population? A detailed engagement with this issue is beyond the scope of this paper but a further discussion of the choice of a reference group for measuring segregation in this study is crucial and will help contextualize this question as well.

2.4 Choice of the Reference Group:

In most studies of residential assimilation, the host population is the majority as well as overall the most affluent. In this study, the reference group is Black South African migrants to the city who are themselves at different stages of incorporation in the city. This is the case for formerly White inhabited core areas of South African cities that were historically serviced by those living in the "Black townships" settled at peripheries of the cities, as part of the Apartheid government's territorial segregation project, as briefly explained above. Given such history, majority of adult Black South Africans living in central areas of post-independence South African cities are likely to be migrants. Their newfound access to residential locations in the city is likely to be determined by a combination of occupational and economic status on one hand and informal racial barriers to entry into specific neighborhoods on the other hand. Inner city of Johannesburg, which has relatively high levels of crime and is lacking in conditions of housing, has become an entry point for Black South Africans hoping to access better economic and educational opportunities for themselves or their offspring but who are

unable to afford housing in the more privileged, predominantly White areas (Beavon, 2003).

These trends are likely to be augmented by the efforts of the municipal government aiming to address the social housing targets in the inner city. For instance, several building renovation and rebuilding projects within the inner city Johannesburg have been sanctioned over the last few years that are aimed at offering affordable, subsidized housing to South African citizens wanting to embrace urban living. In 2004, the South African government delivered a new comprehensive program on housing called 'Breaking New Ground' with an emphasis on rental accommodation for the poor, reduction of social housing backlog and aimed at promoting racial integration. Both the Johannesburg Housing Company established in 1995 (with funding from European Commission) as well as the newer Johannesburg Social Housing Company established in 2005 have programs that offer units for rent and sale exclusively to low income South African citizens. However, there are stringent documentation requirements (such as birth certificates, employment letters, identification documents etc.) to rent or purchase these units that are likely to exclude the poorest segments of even the South African citizenry, who at times do not even hold the official South African ID document. Therefore, it would not be a stretch to state that population of Black South Africans residing in the inner city is likely to inhabit relatively better buildings than the African immigrants in the area, several of whom are refugees, asylum seekers or even undocumented. As a host reference group in this study, Black South Africans not only represent the majority of host population but are also likely to enjoy better residential outcomes as compared to the immigrants, despite being relatively disadvantaged with respect to the White South African minority.

Given this discussion, the objectives of this study can be specified as follows, (a) to describe the pattern of distribution of each of the three sampled populations over the entire study site with respect to the other two, and (b) to propose meaningful measures of residential isolation and residential assimilation for immigrants as compared to the South African internal migrants. As will be discussed in the following section, the availability of spatial point data (x-y coordinates on residential locations of individuals in the study) allows for modeling residential segregation in a more spatially meaningful manner. While the scope of this paper will be limited to an understanding of the relative residential patterning of the three national groups present in this study, the concluding discussion will suggest further directions that could build upon the findings of this paper. Based on the foregoing discussion, I hypothesize that:

- (1) There is likely to be a high overall level of segregation in the inner city among the three national groups.
- (2) Each of the immigrant groups is likely to be highly segregated from the group of South African internal migrants.

3. Data:

This study uses data collected by under Migration and Health survey (2007) in Johannesburg, South Africa under the auspices of the University of the Witwatersrand (Johannesburg). This survey was funded as one of the stages of a mixed methods study supported by an eighteen month grant from Mellon Foundation's Joint Mellon Node on Migration and HIV. Four migrant communities living in the inner city Johannesburg, namely Somali, Congolese, Zimbabwean and South African (rural-urban migrants) were included in the study. Being a primary investigator on the study, I have access to both the qualitative (focus groups and semi-structured interviews) and the survey data. While I only utilize the residence location information and nationality information from the survey data in this study, I will draw upon some insights from the qualitative work while interpreting the findings.

Information from the survey stage utilized in this study was planned as a follow up to the qualitative data collection that generated baseline information on settlement patterns of the communities along with other information on health conditions and behaviors of individuals in the four migrant communities. This survey data contains detailed information on a range of variables seen to influence migrant populations' HIV risk, including limited migration histories, contact with host and origin communities, information about social networks and social support in Johannesburg and detailed socioeconomic indicators and a range of questions on health seeking behaviors. For the purpose of this study only a subset of the respondents (219 Congolese, 258 Zimbabwean and 278 South Africans) is considered. This was done to make more meaningful spatial comparisons of residential patterns by selecting respondents falling within a contiguous sampling boundary that contains a range of inner city neighborhoods. The selected boundary is also meaningful in so far as it falls strictly within the City of Johannesburg's Urban Development Zone⁴ where most of the social housing projects of the inner city are located whereas some of the other sampled neighborhoods do not.

The data used for this study is one of the only available survey data with migration information that was collected using a spatially based, random sampling strategy in the inner city Johannesburg area, and to my knowledge, in South Africa. For gaining clarity about the nature of this data for the purpose of this analysis, two components to the sampling strategy are important to elaborate upon: (a) community foot mapping (b) spatial random sampling of residential buildings.

⁴ There is no consensus on the areas that fall within or constitute the 'inner city'. UDZ boundaries is one of the ways in which the city administration defines the inner city boundaries. For the entire survey sampling, the researchers used the migrant community populated areas that fell within loosely defined boundaries of the inner city. However, for this study, sampled areas falling under the UDZ boundaries are being utilized. As will become clearer in the discussion below, this was also the area for which a unique geo-database was available while for the rest of the areasa GIS was constructed using information on plot locations City of Johannesburg GIS was used.

3.1 Community foot mapping:

Given the lack of baseline information on the residential locations of immigrants living in the inner city of Johannesburg the team for the Migration and Health project (2007) decided to undertake an informal mapping of the communities living in the inner city. A Community Mapping Sheet was prepared and given to multiple fieldworkers who carried out a mapping of spaces inhabited and frequented by the migrant communities on foot. This was done based on their own knowledge, inputs from the information generated during the qualitative phase and in consultation with other community members and organizations. On the sheet, the field workers not only specified the streets and cross streets of the where migrants were 'usually observed', but also broke it down by type of structure (residential, business and other). Each one of these three categories was further specified. If residential, then the field workers were asked to record whether the structure was a high rise building, a stand alone house or a shack; if business, was it formal or informal; and if other, a description of the activity taking place. This also worked as a good opportunity to inform the migrant communities about the survey being undertaken to minimize potential hostility towards surveyors and suspicion regarding the survey motives.⁵ The Community Mapping Sheets from different fieldworkers were reconciled with each other and further augmented using member residential lists from NGOs and churches, where possible.

The end product of this migrant community mapping exercise were printed maps of inner city Johannesburg with streets highlighted where each migrant group was 'known' to reside. The main reason for collecting information on all the places where migrants could usually be found (and not just residential areas) was to have a back up strategy for finding respondents in case the random sampling method did not work for any number of unforeseen circumstances. Another advantage of this mapping was that the sampling frame was not constrained by arbitrary politically or administratively defined boundaries (such as wards, tracts, enumerator areas used in censuses etc.). This provided a better understanding of the social meaning of the space occupied by different migrant communities prior to the survey. Interestingly, the mapping information we received did not seem to suggest the presence of scattered but dense clusters of immigrant settlement across the inner city that would make random sampling impossible, as had been lamented by other surveys in the inner city as a reason for the failure of their sampling strategies (see for instance, Jacobsen and Landau 2003, Vigneswaran, 2007).

3.2 Spatial Random Sampling:

During the exploratory phase described above, an inner city 'building footprints' geo-database from a Johannesburg based urban development consultancy group was discovered. This relatively unique geo-database with several GIS layers was developed

⁵ This was important given that there was at least one previous instance, which we were aware of, where a UNHCR supported HIV KAP study had to be withdrawn from the field due to rumors regarding the institutional targeting of the immigrants by the government in cahoots with the refugee protection agency. Based on information provided by Coordinating Body for Refugee Communities.

by the consultancy group to cover the primary and secondary land use patterns and building condition information for the City of Johannesburg UDZ. For the purposes of the survey, a GIS was created from this database that consisted of a building footprint layer for the inner city neighborhoods in the UDZ (covering the inner city neighborhoods that this study is focusing on). Plot layers from City of Johannesburg corporate GIS (CoJ GIS) were used to map any portion of the area falling outside of the UDZ boundaries. An accompanying street layer was also imported from the CoJ GIS to match the buildings with the community foot mapping information. Migrant community specific sampling polygons were then developed based on the maps generated in the community mapping exercise. 'Building footprints' and plots that fell within these polygons were then extracted to form the population of residential structures within a GIS database, from which the survey sample was drawn.

While the building footprint layer had building attribute data that allowed for the exclusion of most type of non-residential building footprints the plot layers did not. From the latter, only those plots that were very visibly non residential (typically, parks or other open areas) were deleted. In the GIS database, each building footprint or plot was tagged with the migrant community of the polygon it fell into. This meant that it could be in multiple migrant community sampling polygons as some of them overlapped. A database routine was then used to randomly sample the layer for each migrant group with a 50% over sample. A 50% over sample was generated to account for any lacunae in accurate data on building or plot land use type or the inability to distinguish between residential and commercial structures in cases where the land use was both commercial and residential. Significant buffer zones were added to the areas highlighted by the migrant community foot mapping exercise, to minimize the key informant knowledge bias. All surveyors were further trained to ask for respondents belonging to any of the specified national groups in every sampled unit visited, irrespective of whether or not it was in a neighborhood identified by the foot mapping exercise as having migrants from a particular community.

After the sample was drawn, a unique identifier was given to each sampled structure. Finally, survey maps were developed, containing the building foot prints (and in a few cases, plots), street names and sample buildings that were highlighted and marked with an identifying number. The unique identifiers for the buildings as well as for the respondents were recorded on the cover sheets attached to the survey questionnaire for each interview collected in order to allow for the linking of the building coordinates with each respondent's survey information that did not include any personal identifiers. This linkage made a point based measure of segregation possible as will be described in the following section.

4. Method for measuring segregation:

4.1 Preparation of the analytical datasets:

A data set containing x-y coordinate information for every respondent was used to calculate the distance between all possible pairs of individuals. This was done by recreating a data set that was a Cartesian product of the x-y data set joined on itself, excluding self joins using Microsoft Access. The distance was then calculated between the paired points using the Pythagorean Theorem. Following this, each surveyed individual was taken as an index person to count and tabulate the individuals surrounding her, *separately* for each nationality. To do this, the distance around each individual was recoded starting with an initial 100 meter radius (as the crow flies) with *increments of 100m to the radius* to get concentric rings centered around an index individual (referred to as *distance bands* from here on) until the farthest edge of the study site. For each index individual, the counts of surrounding individuals were done separately for each nationality. Conceptually this process can be thought of as follows: initially persons in the first 100m of an individual were counted for each of the three nationalities. Then the distance was increased by 100m to get a radius of 200m. This time only those who were between 100m-200m distance band of an individual were counted, i.e. the persons within the previous radius were not counted again. From this point onwards, this information was used in two different ways.

First, this exercise generated *three* tables such that there was one table for all individuals vs. counts for each nationality parsed by distance bands from 100m to 6700m i.e. 6700 distance bands in total. The three tables were exported into STATA, individually reshaped, and then merged together to get **Dataset A** with 6700 rows for each individual ID. This was done in such a way that for each individual ID and distance band, there were three columns corresponding to the counts of South African, Congolese and Zimbabwean points respectively for each ID and distance band combination. For ease for future reference, I will refer to this as *Dataset A* and it will be used to calculate *neighbor scores*, as described in detail below.

Second, the initial information was used to generate nine additional Excel tables paring individuals belonging to each nationality separately with every nationality (including self nationality) over distance increments of 100m up until the farthest edge of the study site (6700 meters). For example, for *every South African individual* in the dataset there would be a separate table counting (1) surrounding South Africans at 100m, 200m, 300m and so on till 6700m (*South African vs. South African table*) (2) surrounding Congolese over the same distance increments (*South African vs. Congolese table*), and (3) surrounding Zimbabwean individuals over the same distance increments (*South African vs. Zimbabweans table*). This was then repeated for Congolese and Zimbabwean individuals in the same manner to get six more tables (three each) that formed the basis of cumulative distribution plots in Figures 1-3.

4.2 Cumulative Distribution Plots Explained:

Three cumulative distribution plots were generated to provide the first initial visual insight into how individuals belonging to South Africa, DRC and Zimbabwe were spatially distributed with respect to each other within the boundaries of the study site. To do this, all persons at each distance band, separately for each nationality pair, were cumulatively summed up across all distance bands. For instance, in the table counting the number of Congolese *surrounding* each South African individual, the summing up at each distance would give *all Congolese falling up to the outer circumference of that distance band for all South Africans in the survey*. The cumulative sums at each distance band were converted into proportions such that they summed to 1. From these tables, cumulative distribution functions for all pairs formed with each nationality were generated and plotted in the graphs in Figures 1-3. To give an example, the curves in Figure 1 denote cumulative distribution functions (CDFs) for all nationality pairs formed for South African individuals in the survey (South African vs. South African; South African vs. Congolese; South African vs. Zimbabwean). These CDF plots therefore start from the lowest value of the distance band (100 m) and show how proportions of individuals of each nationality accumulate as the distance increases. This exercise, as we will see in the following section, provided an important visual insight into the relative spatial patterning of national groups.

4.3 Developing segregation statistics:

Dataset A in STATA (explained above), was used to calculate the following segregation statistics for each group using non-parametric measures of association (a) Cramer's V as a measure of *overall level of segregation* for the city based on the survey sample including three nationality groups; (b) Yule's Q as a measure of *residential isolation* of each national group from the other two; and (c) Yule's Q as a measure of *residential assimilation* of the two immigrant groups relative to the proximity with the South African internal migrants taken as the host population. Contingency tables for the calculation of these statistics required a several prior computations and data manipulations to get a dataset structured such that there was only one row per individual having a unique ID. The most important step to get to this data structure and for constructing the contingency tables was the calculation of nationality specific "final neighbor scores" (one neighbor score per nationality) for each individual ID. It is useful to describe the construction of these neighbor scores in some detail as they form the basis of estimating the level of segregation in the study site.

Neighbor scores were developed to capture the extent to which an individual is surrounded by persons from each of the three nationalities *across* the study area using an inverse relationship of distance from the reference individual. The idea was to determine whether an individual at a geographical location is, *on the whole*, surrounded by those belonging to her own nationality (*own nationality neighbor score maximum*) or by a different national group (*any other nationality neighbor score maximum*), within the boundaries of the study area. To do this, STATA Dataset A was considered that contained (a) 6700 rows for each individual ID corresponding to distance bands (b) three

columns corresponding to counts of individuals of each nationality falling in each distance band for that ID and (c) a fourth column for the nationality for the individual identified by the unique ID). For each ID and distance pair in the Dataset A, first the following calculation was made to get a *distance band specific neighbor score* and repeated *separately* for each nationality column corresponding to the ID and distance pair.

$$\text{Distance-band specific neighbor scores} = \text{NS}_{\text{specific}} = \left[\frac{P_{ij} / P_j}{r_i} \right]$$

Where:

p_{ij} = Proportion of individuals of a nationality i in a distance band j , where i could be South African, Congolese or Zimbabwean and j ranging from 100 to 6700.

P_j = Proportion of total surveyed individuals (of all nationalities) falling in that distance band j .

r_j = Outer radius of each concentric ring forming incremental distance bands corresponding to the values of a distance band ranging from $j=100$ to $j=6700$.

In terms of the Dataset A structure, for every individual, now there were three more columns, in addition to the four listed above, associated with each distance band for every ID corresponding to each of the three nationalities namely, South African Zimbabwean and Congolese.

ID	Nationality	Distance Band	SA Count	Congo Count	Zim Count	Neighbor Score SA	Neighbor Score Congo	Neighbor Score Zim
1	Congolese	100	Nsa	Ncong	Nzim	NS _{specificSA}	NS _{specificCongo}	NS _{specificZim}
1	Congolese	200	Nsa	Ncong	Nzim	NS _{specificSA}	NS _{specificCongo}	NS _{specificZim}
1	Congolese	.	Nsa	Ncong	Nzim	NS _{specificSA}	NS _{specificCongo}	NS _{specificZim}
1	Congolese	.	Nsa	Ncong	Nzim	NS _{specificSA}	NS _{specificCongo}	NS _{specificZim}
1	Congolese	6700	Nsa	Ncong	Nzim	NS _{specificSA}	NS _{specificCongo}	NS _{specificZim}

Table 1: Structure of Dataset A after the calculation of distance-band specific neighbor scores per surveyed nationality per individual

Finally, the multi-distance band nationality specific neighbor scores were summed up using the *collapse* command in STATA by each individual ID. This summing of the scores across the rings for all specific neighbor scores gave three *final neighbor scores*-one per nationality per unique ID.

$$Final\ Neighbor\ Score = NS_{Final} \sum_{j=100}^{6700} \left[\frac{P_{ij} / P_j}{r_i} \right]$$

(The meaning of the terms in the mathematical formulation remains the same as above.)

This is what a section of the collapsed Dataset A would look like:

ID	Nationality	Neighbor Score SA	Neighbor Score Congo	Neighbor Score Zim
1	Congolese	NS _{FinalSA}	NS _{FinalCongo}	NS _{FinalZim}
2	South African	NS _{FinalSA}	NS _{FinalCongo}	NS _{FinalZim}
3	Congolese	NS _{FinalSA}	NS _{FinalCongo}	NS _{FinalZim}
4	Zimbabwean	NS _{FinalSA}	NS _{FinalCongo}	NS _{FinalZim}
5	South African	NS _{FinalSA}	NS _{FinalCongo}	NS _{FinalZim}

Table 2: Structure of Dataset A after the calculation of final neighbor scores per surveyed nationality per individual

4.5 Calculations involved in measurement of overall segregation, residential isolation and assimilation:

These scores, as calculated above, were used to determine the level to which an individual was surrounded by neighbors from each nationality. The three nationality specific *final neighbors scores* were used to determine whether or not a person could be classified as (a) a residentially isolated individual (i.e. has maximum normalized neighbor score for her own nationality - denoted by a binary variable generated as ***SelfMax***), (b) a residentially assimilated individual (i.e. highest neighbor score for the individual is South African - denoted by a new binary variable generated as ***HostMax***).

Following White et al (1994), I calculated an overall measure of segregation for the study site, a measure of group isolation and another of host group assimilation that can be statistically tested using non-parametric *measures of association*. Cramer's V statistic to estimate an overall level of segregation in the study site was computed by tabulating the variable Nationality with variable SelfMax. Cramer's V is a normed measure of association taking values in the interval [0,1] and can be used when row marginals equal column marginals. The measure V is likely to be larger if there are more people who score 'highest' on co-ethnic neighbors score relative to the scores for the remaining two nationalities.

I summarized national group *residential isolation* using Yule's Q, a measure of association. Yule's Q is a symmetric measure based on the difference between concordant (P) and discordant (Q) data pairs in a 2 X 2 table.⁶ It equals this difference (P - Q) as a percentage of all non-tied pairs (P + Q). To calculate this, each group (Zimbabwean, Congolese and South African) was considered separately and tabulated in a 2 X 2 table for membership in that group (1=Yes, 0= No) versus SelfMax [1, 0] i.e. whether co-ethnic neighbor score was highest (1) or neighbor score for any other national group was highest (0). The hypothesis being tested was that of co-national homophily in residential space i.e. individuals in the sample are likely to score the highest on the neighbor score for their own nationality. The *null hypothesis* was one of predictive independence here, namely that there is *no relationship between nationality of individuals and that of their neighbors*. In this 2 X 2 formulation, positive values of Yule's Q indicate the level of isolation of a group. Values close to zero indicate an absence of or a low level of clustering while values closer to 1 indicate high levels of residential isolation for the national group members.

Similarly, using Yule's Q again, *residential assimilation* was calculated for Zimbabweans and Congolese individuals but this time by tabulating a 2 X 2 table for national group membership in that group (i.e. Congolese or Zimbabwean) and variable HostMax (i.e. whether for an individual scores highest on South African neighbor score where HostMax=1 or whether the individual scores highest on other nationality neighbor score where HostMax=0). Chi-square statistic was used to test formally for the presence of association in all these calculations.

5. Results: Levels of Segregation by National Group across the Study Site

5.1 Analyzing the Cumulative Distribution Plots:

The cumulative distribution plots are very instructional for the purpose of this analysis. To begin with, we know that the slope of cumulative distribution functions (CDFs) are expected to be steep where there is a concentration of values and shallow where the values are sparse. With this in mind, a scrutiny of the graphs in Figures 1, 2 and 3 below shows that both South African migrants to Johannesburg as well as Zimbabwean immigrants are both highly self-clustered as well as proximate to each other. But this is not the case for the Congolese who seem to be quite isolated from South African internal migrants as well as from the Zimbabweans. The graphs further show us the extent and nature of clustering for these groups. For South Africans, 50% of the Zimbabwean survey sample and almost 60% of the South African sample is observed within 500 m. But less than 1% of the Congolese surveyed individuals fall within this distance. To cover 50% of the Congolese individuals when taking South Africans as the reference group, we have to go beyond 2 Km.

⁶ In other words, if the cells of a 2 X 2 table are marked a, b, c and d such that a and d lie on one diagonal and b and c line on the other diagonal, then P would be equal to a*d and Q would be equal to b*c.

It is also interesting to note that for Congolese (Figure 3), 50% of their co-national survey sample coverage takes place only by 900 m, almost half as rapidly as that for South Africans (Figure 1) and Zimbabweans (Figure 2). Again, whereas 90% of South Africans reside within 1 Km of their co-nationals and 90% of Zimbabweans fall within 1.5 Km of their co-nationals, Congolese only reach the same coverage of their compatriots beyond 2.5 Km. This shows that while all groups tend to live close to their fellow nationals, Congolese are less densely clustered in physical residential space as compared to the other two groups. At the same time, Congolese are also less residentially assimilated with South Africans as compared to Zimbabweans. This is interesting as most Zimbabweans in the inner city are relatively new arrivals but seem to settle in residential areas coinciding or in close proximity of South Africans. A substantive interpretation of these patterns is needed, but before doing so, a discussion of the segregation statistics for overall segregation level, residential isolation for each group and residential assimilation for the two immigrant groups is provided. If the calculations are correct, the statistical results should confirm the eye inference based interpretation of Figures 1-3.

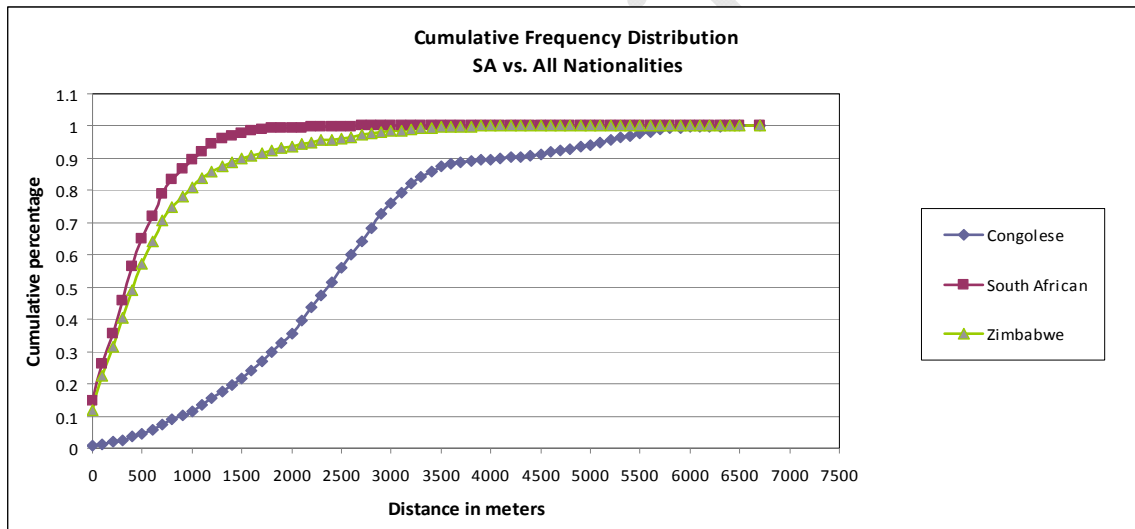


Figure 1: Cumulative frequency distribution plot for South Africans individuals in the survey paired with members of each of the three national groups

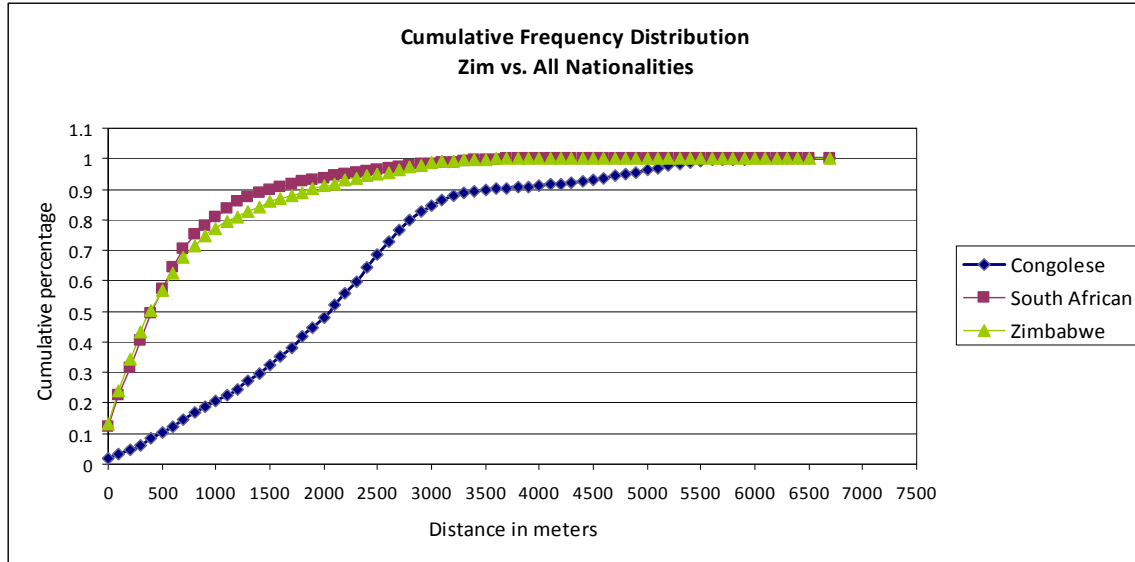


Figure 2: Cumulative frequency distribution plot for Zimbabwean individuals in the survey paired with members of each of the three national groups

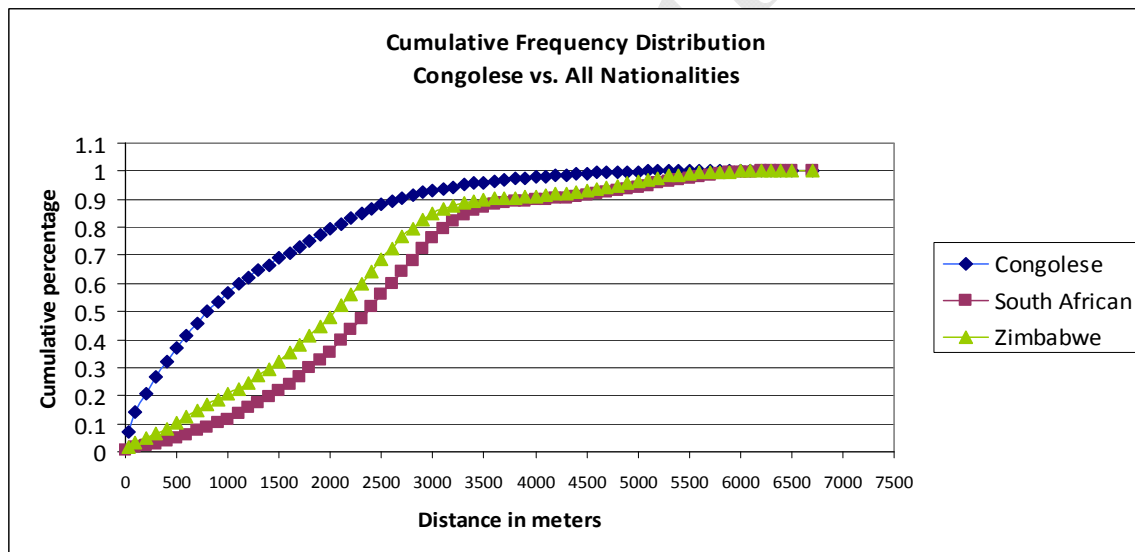


Figure 3: Cumulative frequency distribution plot for Congolese individuals in the survey paired with members of each of the three national groups

5.2 Overall measure of segregation across the study site:

Cramer's V, as described in the previous section, can be understood as a summary measure of segregation for the distribution of Congolese, Zimbabweans and South Africans relative to each other across the study site. The calculations yield a value of 0.48 for Cramer's V that is highly significant based on chi2 statistic at 0.001 level. This means

that the nationalities are not randomly distributed across the study site. In other words, there is statistically significant and a high level of nationality based clustering, as expected by the first hypothesis presented at the end of section 2.4.

Although we have established that the distribution of these three nationalities in the inner city Johannesburg is not random, this does not tell us anything about the group specific patterns of segregation. As suggested by the cumulative distribution functions plotted above, Zimbabweans and Congolese do not seem to have the same spatial relationship with South Africans in the study site. Therefore, in order to gain further insight into the segregation picture, group specific measures of residential isolation and residential assimilation using Yule's Q are discussed.

5.3 Group Specific Measure of Residential Isolation:

The calculations of Yule's Q for residential isolation show that all three national groups show residential isolation within the study site albeit at different levels (See Table 3 below). All Yule's Q statistics are significant at 0.001 level. The Congolese show the highest levels of segregation (0.9907) implying that they rarely neighbor with South Africans and Zimbabweans considered together. This is followed by South Africans at 0.7439 and Zimbabweans at 0.5346. Interestingly, Zimbabweans are much less residentially isolated than the other two nationalities. This confirms the discussion based on cumulative frequency distribution graphs presented above. But the fact that South Africans have a higher score on residential isolation than Zimbabweans is curious. This could be linked to better social housing opportunities that may be concentrated in certain parts of the inner city and exclusively available to South Africans, which may be contributing to their clustering in certain areas. A further discussion of these patterns will be provided in the following section.

Before moving on a discussion of the results from the residential assimilation statistic, it is worth being reminded that we are working with a survey sample, which while randomly sampled is not representative of the complete nationality composition of the study site. Therefore, what we can infer here is the extent to which the group is isolated from Zimbabweans and South Africans only. For example, here we find that the Congolese are highly isolated with respect to the other two groups in the survey sample. But other nationalities, such as the Ethiopians, Malawians, and Mozambicans etc. may also be living in the same neighborhoods as the Congolese depending upon their migration histories, family patterns and other socio-demographic characteristics. If a representative sample of underlying population composition were to be taken in the same study area and using similar random sampling methods, we may find they may not score high on residential isolation statistic per say due to neighboring patterns with other nationalities. However, we would expect to find that they continue to be segregated from the two groups included in this study (Zimbabweans and South Africans).

Nationality	Yule's Q
Congolese	0.9907***
Zimbabwean	0.5346***
South African	0.7439***

Note: Significance for associated chi-square statistic: * p<0.10; ** p<0.05; *** p<0.001

Table 3: Co-national residential isolation versus other two national groups

5.4 Group Specific Measure of Residential Assimilation:

Consistent with the cumulative frequency distribution function graphs, we find that Zimbabweans have a very low level of segregation (Table 4 below), which (not surprisingly) is only significant at 0.1 level of significance. This is however inconsistent with the second hypothesis postulated at the end of section 2.4 with respect to the Zimbabweans. Although, Zimbabwean nationals show a relatively high level of residential isolation, they are also found to be interspersed with the South African host population. It is important to point out that while semantically the term assimilation might seem to be the inverse of isolation, it taps into a different aspect of the story of urban segregation. For instance, residential patterns of Zimbabweans in this study present a scenario where members of an immigrant group share the same residential space with the host population but also show high co-ethnic clustering.

Calculations also reveal a curious situation of “perfect” segregation of the Congolese from the reference host population of Black South African internal migrants. An interpretation of this is simply that no individual of Congolese nationality scored highest on his/her South African neighbor score, calculated by using a distance decay measure of spatial proximity across the study site (as described earlier). This is consistent with the second hypothesis pertaining to the Congolese segregation from the South Africans. The reader is urged not think of this as a situation where no South Africans live within any reasonable distance of the Congolese or that there is no instance of them being neighbors. While this measure is definitely implying that South African internal migrants and Congolese do not frequently live in the same areas within this sample, it should be remembered that this measure is losing information in the dichotomization employed to calculate the HostMax variable. Further, as noted with regard to the limitations of incomplete population composition in the survey data, it is very possible to see a situation where Congolese are residentially intermingled with individuals of other nationalities and as such have a low score of residential isolation while remaining segregated from Black South Africans.⁷

Finally, a reminder about the nature of the reference group is necessary while interpreting the results from these calculations. Residential assimilation of these two immigrant nationals is being understood only with respect to host population of South African

⁷ For a comprehensive discussion of this, see White et al (1994).

internal migrants. In other words, this measure of residential assimilation gives us an indication of the extent to which we can expect to see Zimbabweans and Congolese co-residing or interspersed with South African internal migrants. However, as discussed earlier, the “host” population is a specific subset of the complete South African citizenry living in South African cities. This is particularly important to keep in mind for the Congolese who have tended to settle in neighborhoods that were traditionally considered White Jewish neighborhoods, some of which were not abandoned despite the post independence perceptions of “Black threat” as compared to some of the other inner city areas (Beavon, 2003). Nevertheless, substantively this point regarding the proximity to White South African individuals should not be over emphasized as most ethnically White individuals living around these immigrant populated areas have created pockets of gated communities aimed to keep out those immigrants perceived as “undesirable elements” (Beavon, 2003). Additionally, the rental prices in such gated communities are likely to be unaffordable for the immigrants in the inner city even if the other discriminatory barriers were non-existent.

Nationality	Yule's Q
Congolese	-1.0000***
Zimbabwean	-0.1732*

Note: Significance for associated chi-square statistic:

* p<0.10; ** p<0.05; *** p<0.001

Table 4: Residential Assimilation with respect to Black South African internal migrants

Even though this method begins to describe spatial distribution of migrant groups in more meaningful ways than a-spatial measures of segregation, its drawbacks should be acknowledged. For instance, the concentric rings for each point are sketched ‘*as the crow flies*’. This is clearly not an ideal manner of visualizing social interactions within and among neighborhoods. Also, although spatial patterning of individuals (as in the CDF plots) and the conceptualization of ‘neighborhood areas’ are given a more meaningful interpretation than those found in analyses based on aggregations (dissimilarity index, entropy etc.), the results based on the segregation statistics presented here are still aggregated in the sense that they are based on concentric rings (in a sense, parcels).

However, I believe that this study offers an important methodological and substantive insights in the measurement of migrant residential segregation. Plus, a systematic spatial analysis of immigrant segregation patterns in a developing country metropolitan makes a key contribution to the existing work immigrant residential segregation and settlement patterns. Finally, the last census in South Africa took place in 2001. But the last five years have seen a huge increase in the numbers and diversity of migration streams to South African cities. Although providing a snapshot view using micro-data, it is hoped that this analysis lends some updated and fresh insights into patterns of immigrant settlement in Johannesburg.

6. Concluding Discussion

The analysis provided here shows that that all three national groups are highly clustered with co-nationals. Interestingly, Zimbabweans are the least clustered even though they have been targets of the worst xenophobic attitudes from South Africans in the recent years, even prior to the well publicized xenophobic violence that broke out in 2008 (Business Day 2001, Mail & Guardian 2001). Compared to the Congolese, Zimbabweans are also more likely to inhabit the same areas as the South African internal migrants, as shown by the Yule's Q for residential assimilation. At the first look this result may seem surprising since in terms of large scale immigration (particularly forced migration) since South Africa's independence, Zimbabweans are relatively recent foreign arrivals. A substantial increase in numbers happened especially after President Mugabe's infamous "Operation Cleanup" in 2005 that displaced the livelihoods of thousands of individuals in Zimbabwean cities. An indication of this can be seen from the number of new asylum applications from Zimbabweans received by the Department of Home Affairs, which increased from approximately 6,000 in 2004 to approximately 190,000 in 2005 in South Africa.

However, there are several other mediating factors causing these settlement patterns for Zimbabweans. Unlike the Congolese, Ndebele speaking Zimbabweans (majority among the immigrants fleeing Zimbabwe) are well versed in Zulu, making it easier for them to mingle as this is the language spoken by the dominant Black South African ethnic group in Johannesburg. Beyond this, the qualitative phase of Migration and Health study found evidence of deep mistrust of Zimbabweans towards each other arising out of the climate of paranoia that the Mugabe regime has cultivated. Suspicions regarding the political affiliations and motives of fellow compatriots seem to prevent the formation of diaspora-based social bonds of mutual trust. If this is the case, the likelihood of an inclination towards a preference for co-ethnic residence with fellow Zimbabweans is going to be low. Visibility of co-national association and identification may be even less preferred when in-group mistrust is combined with the experience of xenophobia from South Africans since early 2000. For instance, in 2000, a mob of South Africans burnt and demolished Zimbabwean residences and businesses in a squatter settlement just outside Johannesburg (CNS News, 2003). Faced with high levels of xenophobia and having the language skills to blend in, many Zimbabweans may be all too keen to be mistaken as South Africans.

In previous sections, I argued that that the availability of better quality social housing for South Africans is likely to be a reason for their residential clustering and relative housing advantage over the immigrants. However, during the key informant interviews of the Migration and Health study, it became clear that some South Africans who have either been able to purchase or rent apartment units under one of the low income housing schemes further sublet the apartments to immigrants wanting to live in better areas, usually at a relatively higher costs. The flexibility and feasibility of sublets is likely to vary by the kind of security agency recruited by the building owner. Perhaps, Zulu speaking Zimbabweans who have found gainful employment and are able to afford

higher rents may be more likely to live next door to South Africans as their language ability may allow for easier mingling with the residents. Further, there has been a long history of mine migration from Zimbabwe to South Africa since the colonial period, especially as compared to the Congolese who mainly arrived in South Africa as war refugees in early 1990s on a large scale. Some young Zimbabwean adults who are new arrivals to South Africa may be able to acquire South African ID documents (a pre requisite to renting in these subsidized or rent controlled buildings) due to the citizenship amnesties that their fathers working on South African mines may have received post-South African independence⁸. These adults may still report their nationality as being Zimbabweans on the survey but for paperwork formalities may be able to pass off as South Africans.

Advantages of language skills, long mine migration history in previous decades that may open channels of acquiring legal status for the incoming migrants is likely to increase the possibility of Zimbabwean co-residence South Africans, especially those who are relatively economically better off than their compatriots. If assimilation with Black South Africans is considered a signifier of social mobility, perhaps a Zimbabweans may be seen as following the trajectory predicted by the spatial assimilation model in this sample.

An underlying assumption in this discussion, as well as in most theories of immigrant adaptation, is that immigrants arrive in host countries with a view to long term stay or at least intending to settle long enough to realize a potential trajectory of economic prosperity. Landau (2006) argues that South Africa's alien population has adopted a strategy of "permanent transit", especially in the face of host population hostility. Particularly the Congolese "express no intention of claiming citizenship in South Africa and see their time in the country as temporary and relatively undesirable" (Amisi and Ballard, 2005). They tend to view South Africa as a stepping stone to other more favorable destinations such as France and Canada. In fact, according to Mang'ana (2004 in Landau 2006), the Congolese "make conscious efforts to avoid close personal relationships with South Africans." This is not only likely to be reflected in their settlement patterns (as found in the results of the current study) but also in the future trajectory of assimilation and adaptation in South Africa.

What is not captured by this spatial analysis of group based segregation is the finer texture of social relationships among the Congolese, which on one hand seems to be marked by residential self-exclusion from South Africans but on the other hand is ridden by intra-group ethnic and tribal fragmentation. Amisi and Ballard's (2005) work on Congolese in South Africa shows that the Congolese carry with them the legacy of ethnic identification and political affiliation in Congo and are therefore unable and unwilling to organize themselves as a cohesive national group. This is a curious combination since the

⁸ As noted by Peberdy (2001), "the first amnesty in 1995-96 offered permanent residence to contract mineworkers from Southern African Development Community (SADC) countries who had worked in South Africa for at least ten years and who had voted in the 1994 elections.....The second amnesty in 1996 was granted to undocumented citizens of SADC member states who had lived in South Africa for more than five years (i.e., who had entered the country clandestinely during the apartheid period)."

Congolese enjoy much more coherent legal status under refugee protection legislation in South Africa and unlike Zimbabweans have been officially supported by the United Nations High Commissioner for Refugees (UNHCR) for a much longer time. If “self-sufficiency and self-organisation along ethnic lines at the micro-level is seen as the basis for material and social security in the hostile South African environment” (Amisi and Ballard, 2005) then it is also likely to affect the long term settlement trajectories of the Congolese in South Africa.

Given that the Congolese currently form the largest immigrant community in South Africa, it is unlikely that we would see the desire to use South Africa as a jumping board to better destinations would be realized for all. Despite being characterized by limited intra-group reciprocity, the residential clustering of the Congolese and the distance from South Africans may be a mechanism to maintain what Stineberg (2005) describes as “cultural defense”, ensuring intergenerational continuity of tradition, language skills and reinforcement of antipathy towards South African culture. Given these dynamics, even though contradictory in terms of the strength of group affiliations, the trajectory of settlement followed by the Congolese is likely to be marked by a lack of social and spatial assimilation in the South African society, at least in the short to medium run, and perhaps somewhat better explained by the co-ethnic residential preference version of place stratification models.

Finally, I have argued that in the case of South Africa, it is useful to consider Black South Africans as a migrant group in their own right and think about their expected residential mobility trajectories i.e. the spatial assimilation processes for the host group itself. As discussed in the theoretical section, Black South Africans were territorially segregated and have only been able to enter the urban, especially the inner city, housing market in the past decade or so. As Heller et al (2009) show, there is still significant amount of Black-White segregation in South African cities. Additionally, a majority of South African rural-urban migrants settle on the peripheries of big cities, where they may have pre-existing family connections. Due to this, one may consider South African migrants living in the inner city to be better off in the sense of being placed closer to job markets, transport routes. It is also possible that this is a selected set of individuals who have been able to effectively cross the legacy of territorial segregation as compared to those who stay in the peripheral peri-urban settlements. In this dataset, it is difficult to say whether these residents came into the inner city directly or whether they followed a step-wise intra-urban mobility pattern. In order to do justice to the assessment the significance of the competing theoretical models discussed in the earlier section in future work, such information would be valuable.

Residential assimilation and neighborhood preferences of Black South Africans moving to the inner city are likely to be important to study not only for the success of South Africa’s democratization project but also for its implications for immigrant settlement patterns. If inner city residence is a coveted residential location for Black South Africans, perhaps we will see very different immigrant settlement trajectories than the ones postulated by ecological models of immigrant assimilation. That having said, residential assimilation of Black South Africans is itself likely to unfold on class lines. Those

entering these areas of the inner city are neither the poorest but also not yet part of South Africa's middle class. In future studies, it would be important to study the housing market within the transitioning South African economy to understand the nature of social and spatial mobility of different groups within urban areas. In addition to class, tribal identities among the South Africans should also be considered as structural factors in social mobility and status attainment since Black South Africans are not a homogeneous group. As Mamdani (1996) points out, the apartheid project of segregation created not only a racially divided society but also one that has sustained divisions on tribal groupings that are likely to play out in terms of favoritism and discrimination at the institutional level in South Africa (e.g. nepotism in appointment to government positions, access to housing loans etc.).

The discussion presented here is by no means a comprehensive treatment of the macro and micro forces that are likely to impact upon the pathways of assimilation and adaptation of selected national groups in a South African metropolitan. Still, by highlighting some of the dynamics at play it hopes to have revealed the complexity of the processes of urban assimilation of migrants in South Africa. Further, by problematizing the conceptualization of host group in the South African case, this study stretches the boundaries of existing theories of spatial and social assimilation of immigrants in the host society in a developing country context. It also highlights the complexities in the nature of urban transformations in South Africa, where urban transition of populations has been delayed due to the mobility constraints on Black populations in the apartheid era. Yet, it only begins to scratch the surface of the issues involved in the successful settlement of immigrants in South African cities. But in doing so, it hopes to have provided fresh insights into the nature and dynamics of migrant settlement in a developing country metropolitan context, made a contribution to the current body of work on residential segregation and provided a basis for future studies in South Africa and other similar contexts.

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