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ETHNIC RESIDENTIAL PATTERNS AS PREDICTORS OF INTRA-URBAN CHILD MORTALITY INEQUALITY IN ACCRA, GHANA[1]

John R. Weeks[2],
Department of Geography, San Diego State University

Allan G. Hill,
Harvard School of Public Health, Harvard University

Arthur Getis, and
Department of Geography, San Diego State University

Douglas Stow
Department of Geography, San Diego State University

Abstract

As cities of developing nations absorb an increasing fraction of the world's population increase, questions have arisen about the potential for emerging inequalities in health within places that are already suffering from inadequate infrastructure. In this paper we explore the pattern of child mortality inequalities (as a proxy for overall health levels) within a large sub-Saharan African city —Accra, Ghana—and then we examine the extent to which existing residential patterns by ethnicity may be predictive of any observed intra-urban inequalities in child mortality. We find that the spatial variability in child mortality in Accra is especially associated with the pattern of residential separation of the Ga from other ethnic groups, with the Ga having higher levels of mortality than other ethnic groups. Being of Ga ethnicity exposes a woman and her children to characteristics of the places in Accra where the Ga live, in which one-room dwellings and poor infrastructure predominate. At the individual level, we find that regardless of where a woman lives, if she is of Ga ethnicity and/or is non-Christian, and if she is not married, her risks of having lost a child are elevated.

Keywords

ethnicity; residential patterns; child mortality; urban; Accra; Ghana

INTRODUCTION

Most of the world's population increase over the next few decades is expected to show up in the cities of developing countries (United Nations Population Division, 2006). This will be accomplished through migration from rural to urban areas, draining rural areas of their excess natural increase, along with rates of natural increase in these cities that are already well above replacement level, and also by the spread of cities into surrounding rural areas. This urban transition is occurring within built environments that are already overburdened and, as a result,

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[2]Correspondence concerning this article should be addressed to John R. Weeks, Department of Geography, San Diego State University, San Diego, CA 92182-4493; telephone: 619-594-8040; fax: 619-594-4938; e-mail: john.weeks@sdsu.edu.

we can anticipate that many areas within developing cities will become increasingly at risk of poor health outcomes. In attempting to understand this process, we are replacing our outmoded notion of a rural–urban dichotomy with a more nuanced view of human settlements as representing a gradient of urbanness both within and between cities (Weeks, 2004; Weeks et al., 2005). The consequence of life along a gradient is that differences in urban characteristics may also be associated with inequalities and there is a small, but growing literature suggesting that sharp inequalities in health are increasingly obvious within cities of developing countries (Montgomery et al., 2003; Montgomery and Hewett, 2005).

Our goal in this paper is to explore the existence of spatial inequalities in health outcomes within a major sub-Saharan African city—Accra, Ghana—and to evaluate the extent to which those inequalities are predicted by patterns of ethnic residential separation or segregation. The most obvious potential source of variability in health within a city is the variation in socioeconomic status that exists from one neighborhood to another. People of different social strata are virtually never distributed in a random fashion within a city. Thus, to the extent that people with more personal and social resources to maintain a high level of health are grouped residentially together, and those with fewer of those resources are grouped with themselves, we can anticipate that spatial variability in health outcomes will follow the spatial distribution of socioeconomic status.

A confounding factor in cities within sub-Saharan Africa, however, is the existence of ethnic groups which tend to reside within certain neighborhoods, rather than being randomly distributed within a city. To the extent that ethnic groups encompass a range of socioeconomic statuses within their membership, the consanguineous pattern of residence mixes up the spatial variability by socioeconomic status and potentially makes it a less powerful predictor of health inequalities than might otherwise be the case. It may be, then, that we cannot properly understand health inequalities in a sub-Saharan city like Accra without taking ethnic residential patterns into account.

THE LINK BETWEEN RESIDENTIAL SEGREGATION AND HEALTH

The literature linking ethnic differences to health and more specifically linking residential segregation to health differences is sparse, but there is an increasing body of evidence that a variety of place-based characteristics may have demonstrable impacts on the health of people in those places, net of their individual-level risk factors. For example, Timaeus and Lush (1995) used Demographic and Health Survey (DHS) data to show that within the same country, women in different urban areas experienced different levels of health. Weich and his associates found that characteristics of the built environment affected measures of depression in London (Weich et al., 2001). Fry et al. (2002) found that in Asia, children in slums had worse health status indicators than children in non-slums. Rytkönen et al. (2001) observed considerable spatial variability in mortality within the city of Oulu, Finland, using the interesting approach of draping a one kilometer grid over the city and measuring death rates within each grid, and then measuring the resulting spatial variability, which they attribute to differences in the characteristics of different places within the city.

The variety of approaches that researchers have taken to link place and health led MacIntyre and her associates to review this literature and propose a conceptual framework that might more adequately define exactly what the characteristics of place are that would have an impact on health (MacIntyre et al., 2002; MacIntyre and Ellaway, 2003). In particular, they noted that “few investigators have attempted to hypothesize what features of the local social or physical environment might influence health, and then tested these hypotheses” (MacIntyre et al., 2002, p. 129). Although their work has focused on the west of Scotland, there are presumably certain kinds of characteristics that make some neighborhoods healthier than others, and they suggested an approach that relies on Maslow's (1986) hierarchy of human needs. In order of importance as derived by Maslow, these include clean air, clean water, nutritious and non-toxic food, adequate shelter, personal security from harm, hygienic protection, education, healing, housekeeping, work, means of exchange, information, transport, personal relationships, religious activities, participation in other group activities, and play. The ability of a neighborhood to meet these needs of its residents depends upon the society's level of development and wealth, and the geographic distribution of resources within that society. It may be possible to create proxies for these overall effects by measuring the material infrastructure and collective social functioning, but it is important that we attempt to identify the pathways by which different aspects of place might influence health. This is complicated by the fact that each measure of health status may have a different local pathway, and the relevance of those pathways may vary by spatial scale. In short, no matter how much we may believe that place affects health, it is not a straightforward task to demonstrate that relationship, and researchers need to lay out their case as carefully as possible.

With those major caveats in mind, we pursue the following major hypotheses as they relate to the impact of ethnic residential patterns on health within Accra: (1) that ethnic intergroup differences may influence the health status of their respective members; and (2) the spatial clustering of ethnic groups (residential segregation) will interact with intergroup differences to exacerbate any observed health differences among groups.

Ethnic intergroup differences can be divided broadly into: (1) the environmental context in which people live, such as the type of housing arrangements and building materials that groups employ; (2) the social environment in which people live, including the occupations and thus incomes that different groups see as appropriate for themselves, as well as the extent to which women and children are discriminated against, producing inferior health outcomes for that segment of a group's membership; and (3) the health-seeking behavior of the group in terms of the use of vaccinations, Western medicine versus traditional healers, and attendance at health clinics and hospitals. All of these cultural practices assume that even when similarly situated economically, some groups may make different choices than other groups and that some choices may serendipitously be associated with better health outcomes than other choices.

The impact of ethnicity on health in sub-Saharan Africa has not been widely examined. Schellenberg et al. (2003) conducted a Medline search that produced only 102 articles on inequalities of health in sub-Saharan Africa compared to 1,151 in the Americas. Importantly, nearly all of the studies of inequality relating to ethnicity referred specifically to South Africa. One of the more relevant of the articles for sub-Saharan Africa is based on data from the Demographic and Health Surveys in the region, showing that differences in child immunization rates vary by ethnicity (Brockerhoff and Hewett, 2000). Childhood immunizations bear an obvious relationship to survival among children and survival to adulthood, so that is an important finding. Brockerhoff and Hewett found specifically for Ghana that members of the Ashanti ethnic group were more likely to immunize their children than were members of other groups. Lado (1992) has observed that the marginalization of women by some ethnic groups in Africa, particularly in rural areas, may lead to nutritional deficiencies and thus poorer health. Different ethnic groups also have different patterns of polygyny, which may influence the health of women within those unions compared to women in monogamous unions, although polygynous unions are much less common in urban than in rural areas (Timaeus and Reynar, 1998).

Inequality among groups is largely expected to have the consequence of lowering one or more group's access to higher status occupations and income, limiting the access to health resources, and potentially forcing people into more densely settled neighborhoods with fewer health amenities. Balk and her associates (Balk et al., 2003) have used Demographic and Health

Survey data to show that throughout West Africa the risk of infant death is closely associated with the education of mothers and access to clean water and toilet facilities. They did not, however, examine these factors in relation to ethnicity. Schellenberg et al. (2003) found a clear pattern in rural Tanzania for the least well-off families to be significantly less likely to seek health care for their ill children, but they did not examine ethnic-specific differences. Note that it is not necessarily easy to sort out the evidence for cultural differences in health outcomes compared to the effect of income inequality.

The most egregious form of inequality is that which imposed upon a group through discriminatory practices, but there is little evidence of this among Black African ethnic groups. The literature on discrimination as it affects health tends to focus on discrimination against Blacks in the United States, South Africa, and the United Kingdom (Acevedo-Garcia and Lochner, 2003). By implication, most other patterns of residential segregation may be due more to self-segregation than to forced segregation. Having said this, however, it is important to remember that the history of a city such as Accra is marked by a relatively formal colonial pattern of segregation of Europeans from Africans, existing alongside the self-separation of different groups from each other (Gugler and Flanagan, 1978; Parker, 2000). Even after independence these patterns have remained, despite not being enforced in any official way.

Very little attention has been paid to the social, economic, and health consequences of residential segregation by ethnic group outside of the richer nations, with the notable exception of Apartheid in South Africa (e.g., Benatar, 1988). It has of course been well-studied in the United States, focusing especially on the residential patterns of Blacks compared to Whites (Farley, 1970, 1976, 1984; Clark, 1991; Massey and Denton, 1993; Farley and Frey, 1994; Allen and Turner, 1996; Farley et al., 2000; Emerson et al., 2001), but extended to Hispanics and Asian groups, as well (Allen and Turner, 1996; Logan et al., 2002). Outside the United States (and outside of South Africa), residential segregation has received the greatest attention in Europe, and especially within the United Kingdom, largely with respect to the enclaves of immigrants from developing societies (Peach et al., 1981; Van Kempen and Van Weesep, 1998; Leloup, 1999; Musterd and Deurloo, 2002; Veldboer et al., 2002).

In sub-Saharan Africa the most relevant cultural traits that might differentiate people socially, economically, and residentially, are related to ethnicity, often linked to mother tongue, which also influences religious preference and even the likelihood of migrating within Africa (Anarfi, 1993; Bloom, 1998; Forrest, 2004). Within the literature on ethnic group differences in sub-Saharan Africa, two themes seem to dominate: (1) differences have often led to inter-ethnic violence; and (2) ethnic differences are viewed largely from a rural perspective because it is there that cultural identities appear to be strongest. To date, there has been almost no research conducted on the impact of ethnic differences within urban areas of sub-Saharan Africa. Only in the Republic of South Africa has there been attention paid to the issue of residential segregation (Benatar, 1988), but there the concern has been Black–White differences and there has been little attention, at least in the literature, to disparities among Black ethnic groups. The major research questions have focused on the colonial policies of segregating Europeans from others, rather than on differentiation among indigenous groups.

Ethnicity within cities takes on special relevance, however, because it is largely in the cities that different ethnic groups interact in an environment in which inter-group rivalry is constrained by the social structure—cities could not survive if groups did not dampen any inherent animosity that might exist. That does not mean, however, that ethnicity is not important; only that its importance may be more subtle than it would be in rural areas. In most sub-Saharan African countries, some ethnic groups are economically, culturally, and politically more influential than others, and to the extent that this is true, the result may be to produce patterns of residential segregation or separation by ethnic group that may, in turn, lead to disparities in health levels as a result of differential access to income, healthy environments, and health facilities.

In this study there are four major questions that we wish to answer, derived from the major hypotheses listed above: (1) What is the spatial pattern of health inequalities within the city of Accra? (2) What is the pattern of residential segregation or separation among ethnic groups in Accra? (3) Is the spatial pattern of residential separation predictive of spatial disparities in health? If so, (4) what are the differences among ethnic groups that seem to account for the health inequalities?

DATA AND METHODS

Study Site

Accra has been the capital of Ghana since 1877, and its history dates back to the late 15th century when the Portuguese built a small fort on the site (Robertson, 1984). For nearly 200 years the Europeans tended to stay on the coast and the Africans were inland. However, in the late 17th century the Ga people relocated to Accra following a violent conflict with the Akwamu people (Akan ethnic group), who were reportedly jealous of the wealth generated by the Ga in their role as intermediaries between the Europeans and other African groups in the lucrative trade in gold and slaves—cocoa was not introduced into the area until the late 19th century (Acquah, 1958). The Ga had been headquartered at Ayawaso, which is now part of the Greater Accra Metropolitan Area, but the battle with the Akwamu sent them to the coast, where they have remained since (Parker, 2000). The Dutch, Danes, Swedes, and British all replaced the Portuguese as the European powers in the area, but it was the British who, by the late 19th century, had the strongest hold on the area. The British at that time attacked the Ashanti capital in Kumasi and declared the area (then known as the Gold Coast) to be a crown colony and moved the capital to Accra.

The original parts of the city owe nominal allegiance to the more important European colonizers —Christiansborg Castle which the Danes had built, Ushertown where the Dutch had presided, and Jamestown where the British presided. Twenty-first century Greater Accra is a sprawling urban area of nearly two million people and the neighborhoods reflect multiple strands of history, including: (1) British-imposed residential segregation by race until 1923; (2) the development of elite areas populated largely by Europeans; (3) parts of the city such as “New Town” that have been reception areas for migrants into the metropolis; and (4) the general lack of an urban plan, leading to wide disparities in neighborhood formality and infrastructure.

Data

The data for our analysis come from two sources. The first set of data is from an anonymized 10% random sample of individual-level census returns from the 2000 Census of Population and Housing for Accra. These data are comparable to the Public Use Microdata Sample (PUMS) data from the U. S. Censuses of Population and Housing. The sample was created for us by Ghana Statistical Service for the Greater Accra Metropolitan Area. For each of the 1,724 enumeration areas (EAs) within Accra, a 10% sample of all records was chosen, resulting in a self-weighted sample for each EA. Because of the relatively small number of cases per EA (a function of the small geographic size of many EAs), we will aggregate the data at the next highest level of administrative boundaries known as localities, of which there are 43 in Accra. We will use these data to create measures of ethnic segregation within Accra, and to create a measure of child mortality.

Our second source of data is from the Ghana Demographic and Health Surveys (DHS), conducted in 1998 and 2003, thus bracketing the census year of 2000. The depth and breadth of the DHS provide a wide range of data, but with the disadvantage that the sample size for Accra is fairly small, thus limiting the extent to which we can analyze those data spatially. Thus, we use the census data to provide the detailed geographic coverage, employing as our dependent variable the only health-related variable (referring to child survival) that is contained within the census data. But we will use the DHS data especially to provide details about the health of children among different ethnic groups within Accra.

Our dependent variable of interest is health (morbidity), which can obviously be measured in multiple ways, but we are limited in this analysis to what can be derived from the census data. The most extreme measure of health and well-being is death (mortality) and, in fact, mortality rates are the single most common measures of morbidity because there tend to be more and better data on mortality than on morbidity (Weeks, 2005). Since morbidity and mortality are highly intercorrelated, the variability in mortality rates should closely track overall morbidity levels in a population. Furthermore, the most sensitive aspects of mortality are those occurring at the younger ages, and the under-five mortality is a commonly used index of overall mortality (and thus morbidity) levels in a population. The proportion of children dying before reaching age five closely tracks the overall life expectancy in most populations (Coale and Demeny, 1983; INDEPTH Network, 2004) and is indicative of the overall level of well-being of children. This proportion is typically referred to as Q5, which is short-hand for ${}_5q_0$, the probability of dying between birth and exact age five.

The calculation of under-five mortality technically requires a complete reproductive history of women, such as those collected in the Demographic and Health Surveys. However, the human regularities associated with patterns of death allow us to make reasonable inferences about this probability from the two questions asked on the census about (1) children ever born to a woman and (2) the number of those children who are still surviving. These two questions do not directly allow us know what fraction of children born died before reaching age 5, but the work of William Brass (e.g., Brass, 1971) and his successors has demonstrated that empirically the ratio of children dead to children born to woman aged 30–34 is a very close approximation to under-five mortality (Popoff and Judson, 2004). The principal caveat in interpreting these rates is that the time reference is somewhat uncertain, because some of the deaths may have occurred more than 15 years ago if a woman now aged 30–34 was married at a young age. This can be a problem if the concern is capturing recent changes in morbidity and mortality, but our interest is in comparing rates in different places at the same point in time, so this should be less of a concern for us than might otherwise be the case.

Our anonymized census sample file contains data for 6,905 women aged 30–34 in 2000 (representing a total of 69,050 such women), of whom 5,655 had given birth to at least one child. For Accra overall, these data suggest an under-five mortality for boys of 154 deaths by age five per 1,000 live births, and for girls the rate is 148 per 1,000. These rates are somewhat higher than data for Ghana obtained in the 1998 Demographic and Health Survey, even when looking at the time reference from that survey of 10–14 years prior to the survey (Ghana Statistical Service and Macro International Inc., 1999). At the same time, we can note that the Demographic and Health Surveys have generated lower estimates of mortality than the Demographic Surveillance System site in Navrongo, Ghana (INDEPTH Network, 2004), so it is not certain that the DHS levels are under-reporting levels of mortality in Ghana, but that is at least possible.

We have plugged the under-five mortality rates into model life tables for West Africa, as calculated by the INDEPTH Network (2004), to yield life expectancies at birth in Accra of 55 years for females and 52 for males. These levels are slightly lower than those reported by the United Nations Population Division for Ghana (United Nations Population Division, 2005), but the likely explanation is that the United Nations is heavily dependent upon the Demographic and Health Surveys for its estimates.

In order to disentangle the effects of ethnicity and place of residence (in terms of residential segregation) on child mortality, we need data not only at the neighborhood level, but also at the level of the individual woman. However, since a woman with one child dead may be more likely to have another child die, we can control for this type of autocorrelation by dichotomizing the variable into whether or not a woman aged 30–34 who has had a child born alive has then had one or more of those children die as of the census date. Of the 5,655 women aged 30–34 who had given birth to at least one child, 28% had lost at least one of those children by the time of the census. Our dependent variable at the neighborhood level reflects this same calculation, and is the proportion of mothers aged 30–34 who have lost at least one child, and serves as the proxy for the level of child mortality.

The key predictor variables of interest are (1) neighborhood of residences, (2) ethnicity *per se*, and then (3) more specifically the pattern of residential segregation or separation by ethnicity. The concept of neighborhood is not well defined in the literature and most researchers face the same situation as do we with respect to Accra: Data are collected in the census for predetermined administrative units and they necessarily form the primary building blocks of any definition of neighborhood. The basic unit of analysis in the 2000 census of Ghana is the enumeration area (EA), of which there are 1,724 within Accra. However, the EAs are small enough geographically that some of them have few or even no women aged 30–34. For this reason, we moved up one administrative level, to the locality, for our analysis. There are 43 localities within Accra and enough women aged 30–34 in each locality to have sufficient statistical power for the intended spatial analysis.

With respect to ethnicity, the population of Accra incorporates members of all of the major ethnic groups in Ghana, and Table 1 shows the census categorizations available to us. The largest group, accounting for 38.6% of the population, is the Akan, a grouping that includes Ashanti and Fanti, as well as Akuapim, Akyem, and Kwahu. The second most important group numerically are the Ga-Adangbe, which includes the Ga and the Adangbe—people of the Accra plains. They account for 26.1% of the total population. Thus, the Akan (largely Ashanti) and the Ga-Adangbe (largely Ga) account for two-thirds of all Accra residents. Historically, the ancient kingdom of Ghana was in the central part of the area comprising the modern country, and the coastal area now occupied by Accra was only sparsely inhabited until about the time that Europeans began to explore and exploit the area. However, the Ga were the first to move there, as noted above, and for that reason were able to establish some of the earliest and still prevalent residential patterns.

The Ewe are the third most populous group. They are largely from the southeastern part of Ghana, between Accra and the border with Togo. The fourth most numerous group is the Mole-Dagbani, also known as Dagomba. They originate in the northern part of Ghana (and into Burkina Faso) and are heavily influenced by Islam. The Guan are from the northeastern part of the country, but are generally not Muslim. Among the less populous groups, the Gurma and Grusi have their origins in the northern part of Ghana, while the Mande represent a diverse west African ethnic group.

Our interest is not only in ethnicity, but also in the effect of residential segregation by ethnic group. We want to know if being embedded within a residentially segregated neighborhood has an impact on health. Since there is little evidence of forced segregation by ethnicity within Accra, the segregation is perhaps more comparable to an enclave effect. We know that in some instances, such as among Hispanic immigrants in the United States, residence in an ethnic enclave may confer some positive benefits for reproductive health (Weeks et al., 1999; LeClere and Sen, 2001; Peak and Weeks, 2002), but the effect may well be negative for the local population. Thus, we will examine global measures of residential segregation among ethnic groups, and we will examine patterns at the neighborhood levels, as well as at the individual level where we will use the percentage of a woman's own ethnic group within her EA of residence as a measure of her residence within an enclave.

As a global measure of residential segregation we use Wong's (2003, 2004) spatial index of dissimilarity, $D(s)$, which is defined as:

$$D(s)=\frac{1}{2}\sum_{i}\sum_{j}w_{ij}|z_i-z_j|\times\frac{1/2[(P_i/A_i)+(P_j/A_j)]}{MAX(P/A)} \quad (1)$$

Where D is the widely used non-spatial index of dissimilarity and

$$w_{ij}=\frac{d_{ij}}{\sum_{j}d_{ij}} \quad (2)$$

where d_{ij} is the length of the shared boundary between areal units i and j, and $|z_i - z_j|$ is the difference in the proportion in the group in question between areal units i and j, and where P_i/A_i is the perimeter-area ratio for areal unit i, and MAX (P/A) is the maximum perimeter-area ratio among all areal units in the study. $D(s)$ compares two groups at a time, but Wong has produced a multi-group index (S) that is based on the overlay of the standard deviational ellipses calculated for each group.

Wong (2002) also created a local index of segregation that measures the interaction potential among different groups in adjacent polygons. However, that measure has the disadvantage of being non-directional. Thus, a low percentage of Akan relative to Ga would produce a high segregation index, but a high percentage of Akan relative to Ga would produce the same index. As a result, we have used the classic location quotient (LQ) as the local measure of segregation between any two sets of groups in area i:

$$LQ_i=\frac{a_i/\sum_{i=1}^{n}a}{b_i/\sum_{i=1}^{n}b} \quad (3)$$

where, as with D, a is the group of interest (e.g, the Akan) and b is the comparison group (e.g., the Ga), and we are summing over all localities (the geographic units serving as proxies for neighborhoods). The LQ has a minimum value of zero, indicating the complete absence of group a relative to group b, and values between zero and one indicate fewer of group a than expected given the spatial distribution of group b (so-called "cold spots"). A value of 1 indicates parity between the two groups, and anything above 1 indicates more of group a than expected ("hot spots"). Since low values can go no lower than 0, whereas high values have no theoretical limit, it is common to transform the location quotients logarithmically if the distribution is skewed (O'Donoghue and Gleave, 2004). However, in Accra the values were not high enough above one to be sufficiently skewed to induce us to introduce the logarithmic transformation.

RESULTS

What Is the Spatial Pattern of Child Mortality Inequalities Within the City of Accra?

The first question that we ask is whether there is, in fact, any spatial variability in health within Accra that merits further attention and consideration. Our measure of health refers to child mortality but, as discussed above, the literature suggests a close connection between childhood mortality and the broader health context of an area. Figure 1 shows the spatial variability in under-five mortality, measured as the proportion of women aged 30–34 in each locality that had lost at least one child by that age. This proportion ranges from .13 (associated with a little more than 10% of children dying by age five) to .346 (associated with more than 30% of children dying before their fifth birthday). There is obvious spatial variability in this index of mortality/well-being, with higher proportions of children lost being particularly noticeable in the southern parts of Accra near the coastline. The existence of spatial autocorrelation is confirmed by the value of Moran’s I at a critical distance of 1500 meters, which is .67 with a normalized z-score of 3.34, indicating a statistically significant level of spatial autocorrelation.

Using the G^* statistic as a measure of local spatial autocorrelation, we have identified those areas in Accra that are “hot spots” with respect to child mortality. As can be seen in Figure 2, these include the older part of Accra near Ushertown and central Accra and also around Nima. These are areas that are popularly known in Accra to be slums and thus places where we would anticipate that health levels would be sub-normal.

What Is the Spatial Pattern of Residential Segregation?

There is variability in child mortality levels within Accra and this variability is not spatially random, but is clustered in specific parts of the city. If there is a correlation with residential segregation, then we expect to see the same spatial variability in that characteristic. First, however, we must establish that there is a global pattern of residential segregation, based on Wong’s spatial index of dissimilarity. The results are shown in Table 2, where it can be seen that the overall multi-group level of segregation is relatively modest at .19, which would normally be interpreted as meaning that 19% of the population would have to move within Accra in order to eliminate residential segregation. However, it can also be seen that some groups are more segregated than others. Of the comparisons in Table 2, the top three values of segregation all involve the Ga, who are concentrated residentially in the older part of Accra near the original port area, and in general are along the coastline, rather than inland.

Since the largest ethnic groups are the Akan and Ga, accounting for about two-thirds of all Accra residents (Table 1), we will focus attention on the spatial pattern of segregation between these two groups, and between them and all other groups. The data in Table 2 show that the spatial index of dissimilarity between the Akan and Ga is .27, suggesting that even after taking neighborhood adjacency into account, 27% of the Akan or Ga people would have to move in order to eliminate the spatial mismatch in residency between the two groups. The spatial index of dissimilarity between the Ga and all other non-Akan groups is .31.

We used the location quotient as a local index of residential segregation of the Ga from the Akan, and the Ga from other groups. There is spatial variability with respect to the segregation of Ga from the Akan and also of Ga from all other non-Akan groups, evidenced by the Moran’s I of .79, with a normalized $Z(I)$ of 4.19. Not surprisingly, given the way that the location quotient is calculated, the pattern is very similar to the simple proportion of the population that is of Ga ethnicity, and Figure 3 shows the spatial pattern of residence of the Ga population. In particular, the Ga dominate areas along the coast, whereas the Akan are inland to the west, and non-Akan, non-Ga groups are concentrated inland to the east.

The residential pattern of ethnic groups in Accra is distinctive largely for the way in which the Ga are concentrated along the coastal part of the city. Virtually every measure of segregation/separation produces the same conclusion that the Ga are spatially distinct from other groups. The Akan are also spatially separate from the Ga and other groups, but not to the same extent as the Ga. It is probably most accurate to represent these patterns less as residential segregation per se, which carries the imputation of deliberate discrimination, but rather the separation of groups one from another, the flip side of which represents concentrations of specific groups within identified geographic regions of the city.

Are Ethnic Concentrations Predictive of Child Mortality?

There is spatial variability in child mortality within Accra, the hot spots of which are especially in Ushertown, central Accra, and Nima. The first two of these, although not the third, are areas in which a high percentage of the population is of Ga ethnicity. There is also a clear pattern of residential separation in which an important characteristic is a concentration of Ga along the coastal parts of Accra. The correlation coefficient of $r = .346$ between child mortality and the proportion Ga is a clear indicator of the overlap of these spatial patterns. A greater preponderance of Ga in a neighborhood is associated with higher child mortality. This is consistent with the overall levels of under-five mortality by major ethnic group, as can be seen in Table 3, which includes data for both Q5 and the proportion of women aged 30–34 who have lost at least one child. The Ga have the highest overall rates of under-five mortality, while the Akan and Ewe have the lowest levels.

The overlap of ethnic concentration and child mortality is somewhat higher than would be suggested by the correlation coefficient shown above. This is especially apparent if we look at the extremes of both phenomena. Among ethnic groups, the Akan and Ga both have one or more localities in which they represent the majority of the population. One of the localities with the lowest proportion of woman having lost a child (by inference the “healthiest” places) exactly overlap one of the localities with more than 50% of its population being of Ga ethnicity. This is Dansoman, in the western part of Accra, in the neighborhood where there are several contiguous localities with a majority of the population being of Akan ethnicity, as shown in Figure 4. The other area sharing the honor of the lowest child mortality is Roman Ridge, which has a near majority of Akan (47%), but not quite a majority.

At the other extreme, Figure 3 shows that the localities with a majority Ga population are along the coast and comprise the localities of James Town, Usher Town, Accra Central, Osu, and Labadi. None of these neighborhoods has the highest level of child mortality but it can be seen that the localities that do carry that honor—South Labadi, Asylum Down, and Korle Dudor/Agbogbloshie—are all contiguous to localities in which the majority of the population is Ga. We interpret this to mean that there is something clearly spatial about the pattern of high child mortality that is related to, but also transcends, Ga ethnicity. This is reinforced by the fact that one of the areas that fell within a cluster of high child mortality (Fig. 3) is Nima, which is diverse ethnically, but is the only locality within Accra in which a majority of the population is Muslim. As we will show below, being non-Christian is also a risk factor for high child mortality in Accra.

Can Differences Among Ethnic Groups Explain Child Mortality Differentials?

It is almost axiomatic in the health literature that poverty promotes poor health and prosperity promotes improved health. Thus, any spatial and/or ethnic inequalities that we have observed may be explainable in terms of differing socioeconomic levels. We have a relatively limited range of variables in the census with which we can gauge levels of economic well-being. These include characteristics of housing, which provide proxy measures of the economic well-being of household members, and human capital variables such as educational and employment characteristics that provide proxy measures of a person's access to societal resources.

Ethnic differences in several measures of socioeconomic status are shown in Table 4, with the highest proportions in each category shown in bold type. These characteristics are based specifically on the microdata sample of women aged 30–34, so that there is no confounding of correlations from different data. Nearly all households in Accra lack a private toilet, but the Ga are more likely than the Akan or other groups combined not to have a toilet, whereas the Akan are more likely to have a toilet. There are public toilets throughout the city that are used by large portions of the population. The majority of dwelling units also lack piped water, but the Ga are not much less likely than others to lack piped water, although they are slightly worse off in this regard than the Akan. The Ga are more likely than other groups to be living rent-free. This means that they neither own nor rent the dwelling, but are either squatting or, more often, living in a home owned communally by the tribe of which they are a member. A large proportion of dwelling units in Accra have only one room. This is shared by all household members for sleeping and other activities. Cooking is usually done outside, and as noted above most dwelling units do not have a bathroom. The Ga are slightly more likely than the Akan and other groups to be in a one-room dwelling.

A majority of Ga women live in a compound which may be comprised of two or more one-room dwelling units. Among the Ga this may be especially associated with polygny, since the Ga women are more likely than the Akan, in particular, to have co-wives. Illiteracy is higher among the Ga women than among the Akan, but other groups in Accra mirror the Ga in having about one in four women aged 30–34 who are illiterate. Most women in Accra are not employed in higher status occupations, but there appear to be no discernible ethnic differences in this regard. Finally, it can be seen in Table 4 that the Ga women are clearly less likely to be married than are members of other ethnic groups. Thus, they are more likely to have borne their children outside of wedlock with the potential for a weaker resource base as a consequence.

We can conclude that at least some of the disadvantage that Ga women have in terms of the health of their children may well be related to a more disadvantaged set of socioeconomic circumstances than found among other ethnic groups, especially in comparison to the Akan. All of these variables are put together in a logistic regression, shown in Table 5, to see if they account for the observed ethnic differences in child mortality. The first model includes Ga ethnicity and evaluates it in comparison to having no toilet, having no piped water, living rent-free, living in a one-room dwelling, and living in a compound. The results in Model 1 show that only two variables, Ga ethnicity and no piped water, are statistically significant predictors of a woman aged 30–34 having lost at least one child, at least at the .05 level of significance. Of these two, only Ga ethnicity is in the expected direction. Counterintuitively, the results suggest that those with no piped water have better health outcomes, at least when all of the other variables in the equation are taken into account.

If we are willing to accept a slightly more liberal .10 level of significance, we are able to conclude that having no toilet, living in one room, and living in a compound are all predictive of a higher risk of losing a child. Noteworthy, however, is that these variables do not explain away Ga ethnicity. Being Ga is still a predictor of losing a child, even when this set of socioeconomic indicators is taken into account.

The second model in Table 5 adds the social capital variables of being illiterate, not having a high occupational status job, and not being married. Illiteracy and not being married are both significant at the .05 level and both are predictive of an increased risk of losing a child. Yet, it remains true that Ga ethnicity is statistically significant even in the presence of these predictor variables. The third model in Table 5 adds two additional factors that have already been discussed, not being Christian and living in an ethnic enclave. Not being Christian emerges as the most important predictor of losing a child in the model and seems to account for the illiteracy factor, suggesting that the illiterate women who are at risk of losing a child are especially likely to be non-Christian.

The percent Ga in the neighborhood in a which a woman lives is one of several indicators of ethnic residential separation and concentration that we examined. None of them was statistically significant as a predictor of child mortality, but of them all the percentage Ga in the neighborhood had the highest beta coefficient. This result is not too surprising given the discussion above regarding Figure 4, in that it was seen that being close to a high-percentage Ga neighborhood, rather than directly in it, seemed to be associated with high child mortality, at least at the aggregate level.

Of these variables, religion—defined as being Christian or not—emerges as a statistically significant complement to Ga ethnicity as a predictor of child mortality. It is a complement in the sense that none of the socioeconomic status variables dampens the relationship between Ga ethnicity and child mortality, but both Ga ethnicity and Christian religious affiliation are independently predictive of child mortality. Being Ga increases the level of child mortality at the same time that being non-Christian increases the level. Although the Ga are predominantly Christian (88%), the data suggest that the highest child mortality is experienced by those Ga who are not Christian. Being non-Ga and non-Christian is also associated with elevated levels of child mortality, as shown in Table 6.

What Is It About Being Ga and/or Non-Christian that Heightens the Risk of Child Mortality?

The data in Tables 5 and 6 suggest that being Ga and/or non-Christian increases the risk of having a child die. Why is that? To answer this question we turn to the 1998 and 2003 Ghana Demographic and Health Survey (GDHS), where questions were asked relating especially to immunizations and the health status of currently living children that might provide clues about the deaths of their siblings. The sample size for the GDHS is too small to make comparisons on the basis of religion, but we can compare the major ethnic groups with one another. In order to achieve a sufficiently large sample size for our comparisons, we pooled the data for Accra from the 1998 and 2003 surveys. The surveys had identical multistage probability cluster designs and asked identical questions, and we make the assumption that any bias that might exist in the five-year span between surveys would have been similar for all ethnic groups.

We look first at the anthropometric measure of weight for height. A value that is beyond two standard deviation units below the reference median is considered to be evidence of nutritional deficiencies. The data in Table 7 show that 6.0% of Ga children under the age of five fall into this category, compared to 4.9% of Akan children and 2.6% of children of other ethnic groups. The difference between the Ga and Akan is in the expected direction, but is not large enough to be statistically significant, whereas the difference between the Ga and others is significant. Thus, we can conclude that one contributing factor to a incidence of child mortality among Ga children might be a tendency toward insufficient nutrition.

Most children in Accra are immunized against tuberculosis (with the BCG vaccine), DPT (diphtheria, pertussis, and tetanus), polio, and measles. Each mother normally maintains a card on which the date of each vaccination is recorded, but the GDHS interviewers probed for additional information in the event of missing data on the card. Based on the card data and mothers' responses, the data suggest that 35% of Ga children under age five in Accra have received less than all of the vaccinations that would be expected. Among the Akan, the percent not having full immunization was 22%, whereas it was 33% among other ethnic groups combined. As with the weight for height measure, the Ga children are at a disadvantage when it comes to immunization from common childhood diseases.

We also looked at two measures of health that are available within the GDHS—the incidence of diarrhea and/or fever any time during the two weeks prior to the interview. Ga children were significantly more likely to have had diarrhea than were Akan children or children of other ethnic groups. This would be consistent with substandard nutritional levels. Ga children were not more likely than Akan children to have had a fever in the prior two weeks. The Ga percentage was higher than for other ethnic groups, but the difference was not statistically significant. Throughout equatorial Africa fevers are commonly associated with malaria, but there was no difference among groups in their use of bed nets, either treated or untreated (data not shown). Similarly, even though Ga children were more likely than others to have diarrhea, they were as equally likely to have been treated medically as were children of other ethnic groups. Equally likely, however, is a relative term, and only about 15% of children received medical treatment for diarrhea and about half received medical treatment for their fever.

DISCUSSION AND CONCLUSION

We have shown that there is spatial variability in health levels in Accra, with areas near the coast and, in particular, in the older central part of town experiencing the highest rates of child mortality. It is in these areas that there are statistically significant clusters of neighborhoods with above-average child mortality. We also found that there is an overall modest level of residential segregation by ethnic group in Accra, but most notable are the spatial concentrations of the Ga along the coastal area, and the Akan in the western part of the city. This pattern seems not coincidentally to be associated with child mortality because the areas with the lowest child mortality are neighborhoods dominated by the Akan, whereas areas with the highest child mortality are contiguous to, if not exactly the same as, neighborhoods dominated demographically by the Ga. A further nuance on the analysis was the finding that the one area with a majority Muslim population is also part of the cluster of high child mortality neighborhoods. This is consistent with the findings from our logistic regression analysis that being Ga and/or being non-Christian put women at increased risk of losing a child.

We have only a limited ability to evaluate why differences exist among groups in terms of child mortality. Data on currently living children from the Ghana Demographic and Health Surveys suggest that Ga children are less likely to be fully immunized, and are less well fed, with the latter possibly being associated with their higher incidence of diarrhea among children. To the extent that child morbidity tracks child mortality (and we believe that they track closely), and to the extent that Ga ethnicity is the single most important predictor of elevated risks of child death in Accra, then we can conclude that areas in the Ga part of Accra are those places in which children's health is most at risk, and areas in the predominantly Akan part of the city are where health is least at risk.

An unexpected finding from our research is the general lack of influence of water and sanitation on health levels. It is commonplace to assume that the worst health will be found in places without piped water, toilets or sewerage, and vice versa. In Accra, this pattern does not generally hold, and the anomaly is probably an artifact of the unplanned and haphazard way in which Accra has developed (Yankson et al., in press). Many areas of the city lack piped water and sanitation. Indeed, of the 43 localities in Accra, only one (Roman Ridge) has more than half of its homes attached to a sewer system. It is a wealthy suburban area that is predictably characterized by low levels of child mortality. Only five localities have at least two-thirds of the houses connected to piped water and none of these has more than three-fourths of the houses so connected. Of these five, three have low levels of mortality (Roman Ridge, Dansoman, and Kaneshie), whereas two have high mortality (Asylum Down and Abelenkpe). Only two of these localities are adjacent to one another (Roman Ridge and Abelenkpe) and yet those two adjacent localities have markedly different levels of child mortality.

The scatter-shot pattern of infrastructure is a consequence of lack of planning in the era since independence during which Accra has increased dramatically in population. At independence in 1957 Accra had fewer than 250,000 residents, but by the 2000 census that had mushroomed to 1.6 million. “A Master Plan of Accra was produced in 1958, but it was not fully implemented. Schemes were prepared for pockets of land, resulting in a series of disconnected plans which fragmented the orderly development of the city. Accra has no coherent, consistent spatial development strategy” (Yankson et al., in press, p. 8). A consequence of this chaotic pattern of development is a more difficult than usual to understand pattern of variability in health levels.

One cultural factor that seems to put the Ga at high risk with respect to health is the attachment to the cultural, religious and spiritual significance of “Old Accra” where buildings are dilapidated, sanitation is poor, and congestion is high (Pellow, 2002). The older parts of Accra in which many Ga live are not the places where infrastructure upgrades have necessarily taken place over the 300 year history of the city. This is aggravated by what Pellow (2002) notes is a long-standing tradition among the Ga of separating themselves from strangers or foreigners. Since the Ga people are essentially from Accra, they do not migrate in from other places, which would give them greater spatial variability. Rather, they tend to grow up and stay in their traditional urban area within Accra, which happens to be the oldest part of the city. Thus, in an almost classic example from geography, the Ga attachment to place puts them in the path of poorer infrastructure and higher mortality, and may also limit their social mobility and their ability to improve themselves socioeconomically. In this way, the spatial concentration of the Ga may exacerbate the already existing ethnic differences, especially between the Ga and the Akan.

It must be kept in mind that although the Ga have a higher child mortality rate than other groups, they nonetheless account for only one in three women who have had a child die before reaching age five. The disjointed development of Accra has created a situation in which spatial variability exists in almost all aspects of life, but the patterns are less predictable spatially than in cities of more developed nations. Our findings suggest that more intensive qualitative as well as quantitative work within specific neighborhoods will be necessary to better understand why health levels vary so as they do throughout the city.

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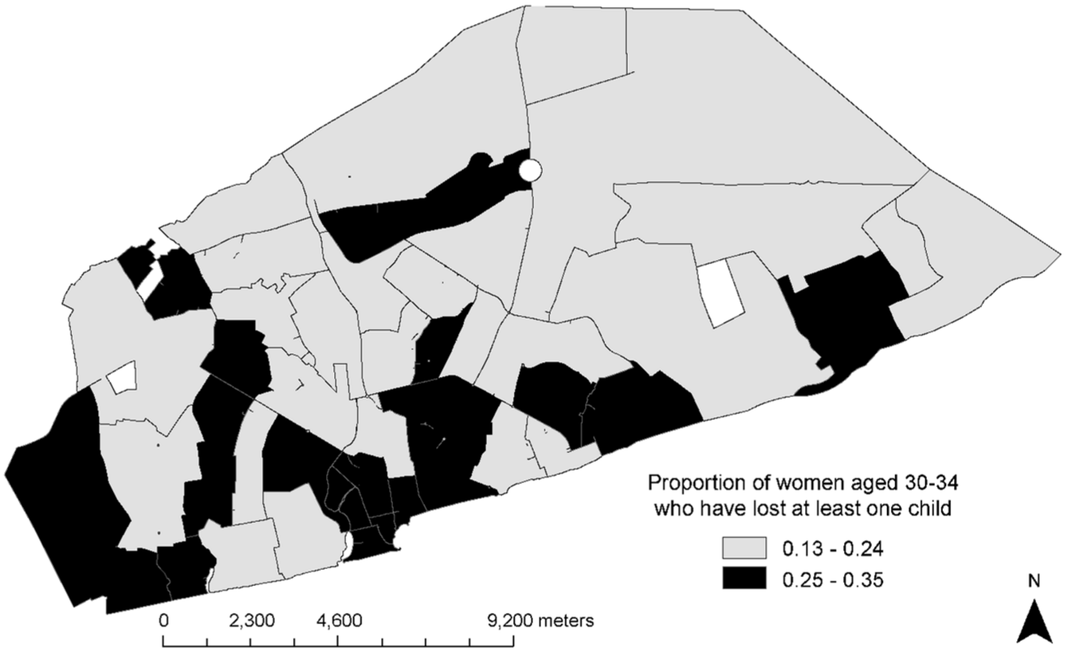

Fig. 1.
Spatial Variability in Child Mortality, Accra, 2000.

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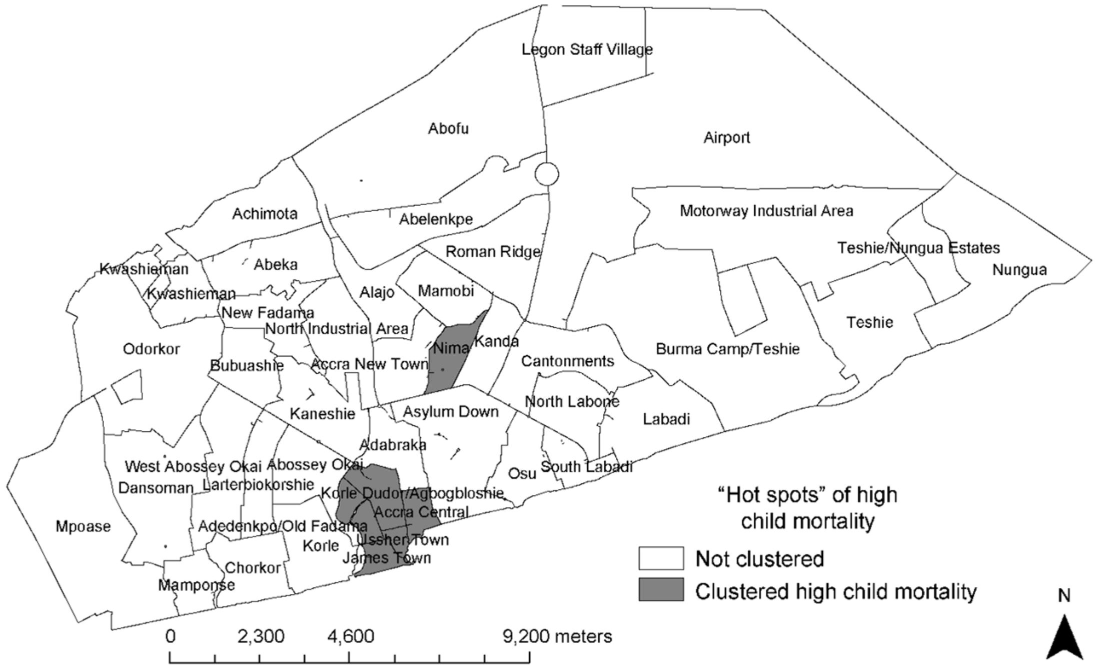

Fig. 2.
Clustered "hot spots" of high child mortality in Accra, 2000.

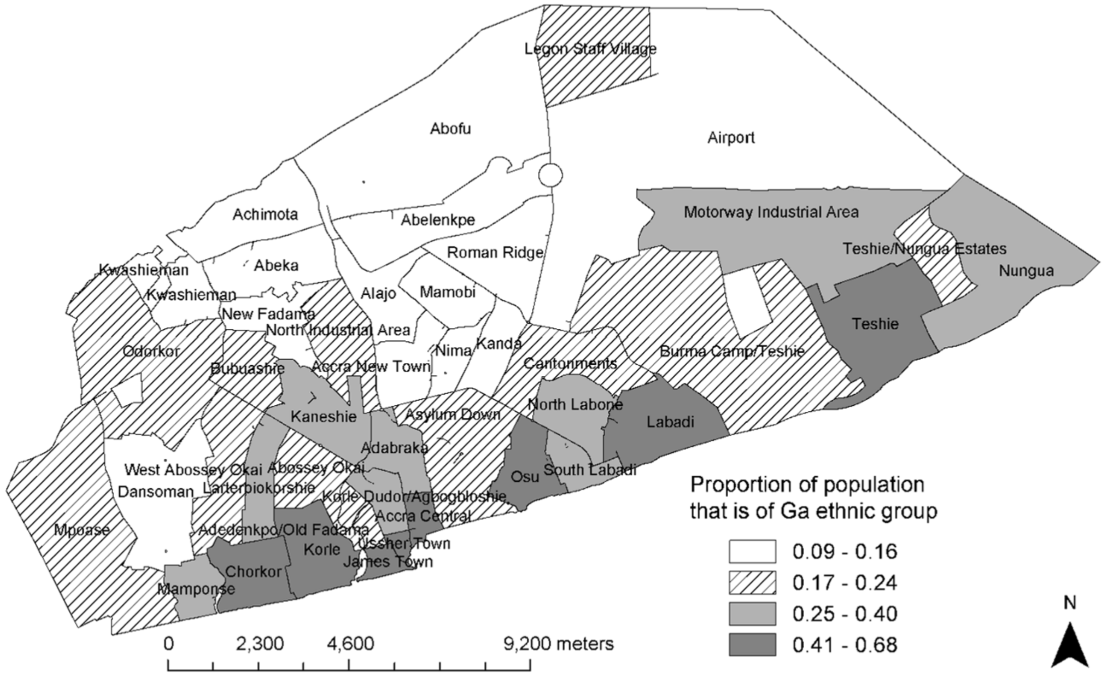

Fig. 3.

Spatial Variability in the proportion of the population that is of the Ga Ethnic Group, Accra, 2000.

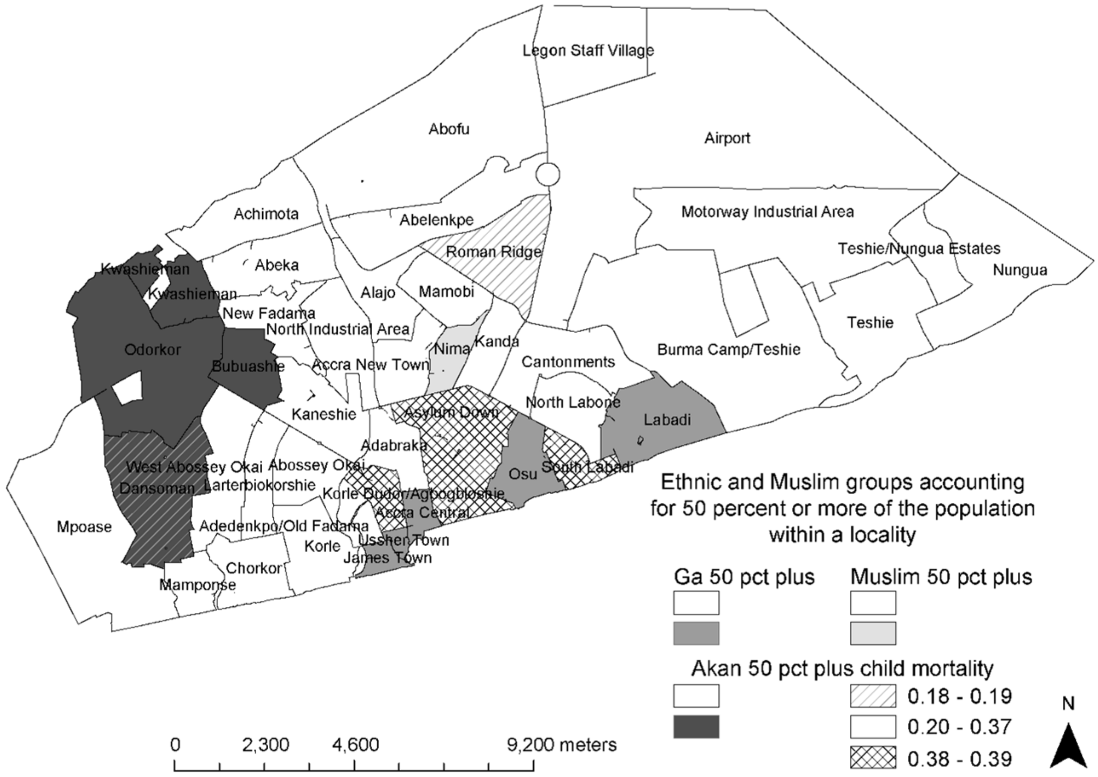

Fig. 4.

The extremes of ethnic concentration and child mortality, by locality.

Table 1

Ethnic Groups in Accra, 2000

Ethnicity	Population	Percent
Akan	641,950	38.6
Ga-Adangbe	434,260	26.1
Ewe	222,990	13.4
Mole-Dagbani	83,720	5.0
Guan	45,160	2.7
Grusi	33,190	2.0
Gurma	14,290	0.9
Mande	15,190	0.9
Other	20,110	1.2
Non-Ghanaian	151,560	9.1
Total	1,662,420	100.0

Table 2

Indices of Dissimilarity for Accra, 2000

	Index of dissimilarity	
Comparisons between ethnic groups	**D**	**D(s)**
Ga and Akan	.31	.27
Ga and Ewe	.37	.33
Ga and Mole-Dagbani	.43	.39
Akan and Ewe	.18	.15
Akan and Mole-Dagbani	.25	.23
Ewe and Mole-Dagbani	.18	.14
Akan and other non-Ga	.17	.14
Ga and other non-Akan	.36	.31
Multi-group spatial index of dissimilarity = .19		

Table 3

Child Mortality Rates by Ethnic Group: Accra, 2000

Ethnic group	**Proportion of women 30–34 who have lost a child**	**Q5**	***N***
Akan	0.264	0.156	22,360
Ga	0.299	0.175	15,920
Ewe	0.249	0.144	7,910
Others	0.279	0.151	10,700
Comparisons	*t*–score		
Ga-Akan	−4.786	−1.898	
Ga-Ewe	−5.416	−2.398	
Ga-others	−2.328	−3.059	

Table 4

Ethnic Differences in Socioeconomic Characteristics

Proportion of women 30–34 who are:	**Akan**	**Ga**[a]	**Non-Ga**	**non-Akan and non-Ga**
Without own toilet	0.73	**0.82**	0.76	0.81
Without piped water	0.55	0.59	0.58	0.60
Living rent-free	0.17	**0.23**	0.17	0.17
Living in one-room dwelling	0.40	**0.43**	0.40	0.40
Living in a compound	0.48	**0.54**	0.49	0.51
Illiterate	0.18	0.24	0.23	0.28
Not employed in a high occupation	0.86	0.86	0.87	0.88
Not married	0.35	**0.46**	0.35	0.32

[a]Highest proportions are in bold.

Table 5

Logistic Regression of Predictors of a Woman Aged 30–34 Having Lost at Least One Child

Predictor	Model 1			Model 2			Model 3		
	B	**Sig.**	**Exp(*B*)**	***B***	**Sig.**	**Exp(*B*)**	***B***	**Sig.**	**Exp(*B*)**
Ga ethnicity	0.159	0.015	1.172	0.154	0.019	1.167	0.168	0.026	1.183
No toilet	0.152	0.064	1.164	0.108	0.194	1.114	0.102	0.228	1.107
No piped water	−0.150	0.022	0.861	−0.166	0.012	0.847	−0.161	0.015	0.852
Live rent-free	−0.091	0.237	0.913	−0.106	0.170	0.899	−0.107	0.168	0.898
One room	0.107	0.082	1.113	0.086	0.166	1.090	0.098	0.119	1.103
Compound	0.108	0.082	1.114	0.109	0.079	1.115	0.101	0.108	1.106
Illiterate				0.153	0.033	1.165	0.107	0.143	1.113
Not high occupancy				0.148	0.110	1.159	0.130	0.159	1.139
Not married				0.134	0.043	1.143	0.129	0.053	1.138
Not Christian							0.281	0.001	1.324
Percent Ga in Enumeration Area							0.044	0.789	1.045

Table 6

Child Mortality by Ethnicity and Religion

Ethnicity	Religion	Proportion of women aged 30–34 having lost at least one child	Census micro-sample size
Not Ga	Not Christian	0.312	712
	Christian	0.255	3,385
Ga	Not Christian	0.376	189
	Christian	0.289	1,403

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Table 7

Differences in Child Health Status by Ethnicity

Health variable	Ethnic group			Comparison *t*-score	
	Ga	Akan	Other	Ga-Akan	Ga-others
Not fully vaccinated	0.354	0.224	0.331	5.94	0.96
Weight for height: 2 or more *SD* below reference median	0.060	0.049	0.026	0.92	3.06
Diarrhea in past two weeks	0.183	0.103	0.138	4.34	2.33
Fever in past two weeks	0.174	0.207	0.158	−1.65	0.82
Pooled *N*	218	164	152		

Source: Unpublished data from Ghana Statistical Services and Macro International, Inc.,Ghana Demographic and Health Surveys (1998, 2003).