



## A tale of two cities: A multi-dimensional portrait of poverty and living conditions in the slums of Dakar and Nairobi



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### ARTICLE INFO

#### Article history:

Available online 12 March 2014

#### Keywords:

Multi-dimensional poverty  
Infrastructure access  
Living conditions  
Employment  
Slums  
Africa

### ABSTRACT

Our understanding of settlement conditions and the nature of poverty across urban slums is limited. Using three simple frameworks, we create a meso-level portrait of poverty and living conditions in the slums of Dakar, Senegal and Nairobi, Kenya. While slum residents in both cities share the challenge of monetary poverty, their experience diverges significantly relative to employment levels, education, and living conditions. Nairobi's relatively well-educated and employed residents suffer from poorer living conditions—as measured by access to infrastructure and urban services, housing quality and crime—than residents of Dakar, who report much lower levels of educational attainment and paid employment. The research findings challenge conventional development theory—particularly notions that education and jobs will translate into lower poverty and improved living conditions. More comparative research is needed to better understand what drives settlement conditions and to create more effective strategies to improve the lives of all urban residents.

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### Introduction

Today more than half the world's population lives in urban areas (UNFPA, 2007). The transition from a rural world to an urban one is the outcome of sustained urban growth in the cities of the global south—from cities like Shanghai and Beijing in China whose growth has captured headlines worldwide, to cities with less popularly recognized growth challenges like Lagos and Kaduna, Nigeria (Kahn & Yardley, 2007; Montgomery & Balk, 2012; Satterthwaite, 2007). Managing rapid urban growth has been especially difficult for the cities of the developing world. The needs of urban migrants have far outstripped the ability of the public (and also the private) sector to meet those needs (Bazoglu, 2012; Dudwick, Hull, Shilpi, & Simler, 2011). The most visible evidence of this failure is captured in the concentrated poverty and poor living conditions of slum settlements across cities of the developing world.

Urban slums, of course, are not a new phenomenon—they have been in existence for decades and studied almost just as long. A rich

body of micro-studies—especially ethnographic and longitudinal studies of specific cities, settlements, and individuals within such settlements—has created vivid images of life within slums (e.g., Goldstein, 2003; Kramer, 2006; Peattie, 1968). Micro-studies have shed light on why people migrate to urban slums and the political/economic struggles of urban migrants over time (Perlman, 1980, 2006), political clientelism and the social isolation/marginalization of slum residents (Auyero, 1999, 2000, 2002), and links between urban residence, slum formation and health inequities (Hunter, 2006, 2007). At the other end of the analytical spectrum are macro-level analyses that examine national and global urbanization trends, emphasize the inexorable increase in slum settlements, and discuss the implications of slum growth for urban service delivery, health outcomes, and quality of life (e.g., Davis, 2006; UN Habitat, 2003, 2012).

There are some crucial gaps in our understanding of slums especially regarding the nature of and variation in poverty in these settlements. Just how poor are slum residents in any given city? In what ways are they poor? Are they worse off than rural residents or their counterparts in other cities? In comparing two slums in a single city, how do we ascertain which settlement is better off and in what way? From a policy perspective, additional questions arise. What can be done to reduce poverty and improve conditions in urban slums? Given budget constraints, which interventions should be prioritized and why?

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We focus on this gap in the literature. This paper emerged from our own struggle to empirically answer these questions for the slums of two African capital cities: Nairobi, Kenya and Dakar, Senegal. Using two specially commissioned randomized-sample surveys of about 3700 households (or 24,145 people) in these two cities, we generated rare and extremely rich empirical data. But we found that the literature offered few precedents that could help us effectively summarize and interpret the results and compare the findings across the two cities. To paint a comparative picture of poverty and living conditions in the slums of these two cities, we needed an analytical framework with 4 critical features. First, we needed a framework that explicitly acknowledges that urban poverty—like human development—is a complex, multi-dimensional phenomenon. Starting with the work of Sen (e.g., Sen, 1985, 1999, 2005; Sen & Anand, 1997), the poverty studies literature has shown the need to go beyond indicators that just measure income or consumption and acknowledge other forms of deprivation (see, for instance, Bourguignon & Chakravarty, 2003; Moser, 1998; Ravallion, 1996; Tsui, 2002).<sup>3</sup> Second, we needed a framework that could convey this multi-dimensionality in a manner intelligible to academics, policymakers, practitioners, and politicians alike. Given that predominant quantitative benchmarks such as “number of people living on a dollar a day” are easily understandable, any proposed complement or replacement needed to be simple and convey the type, nature and/or extent of the deprivation(s). Third, the framework needed to deploy a parsimonious number of indicators to make it feasible to collect, analyze and comprehend the requisite data. Finally, we were interested in a framework at the *meso*-level—positioned in-between macro-level analyses that treat all slums as one category, and the micro case-specific analyses that treat each settlement as unique. The framework should facilitate contextual understanding—required to allow for interventions to be tailored to a given situation—without being paralyzingly narrow or overly general.

We developed three inter-related but simple frameworks; we deploy them here to tell a tale about the slums of Nairobi and Dakar. The three frameworks—the Development Diamond, Living Conditions Diamond, and Infrastructure Polygon—graphically present a summary focusing on 16 dimensions (and 14–20 indicators), chosen carefully from a data set of about 500 indicators. We show how the three radar graphs of thematically grouped variables provide a useful way to aggregate data, graphically/visually observe relationships between dimensions, and examine differences within and across cities. Table 1 defines the sixteen dimensions.

Our first framework—the Development Diamond—posits that poverty and development can and should be understood along four discrete but inter-related dimensions: monetary welfare, employment, education, and living conditions, including infrastructure access. Using this framework, we find that although slum residents are monetarily poor in both cities, *the nature of their poverty differs dramatically*. In Nairobi, slum residents are educated and most are employed, but they have appalling living conditions. Dakar's slum residents have fairly decent living conditions, but very low levels of educational attainment and paid employment. Thus, the Development Diamond helps us create a multi-dimensional snapshot of poverty or welfare, indicating the way in which slum residents are poor in a given settlement or city, and also the ways in which they are better or worse off than their counterparts in another location.

<sup>3</sup> The struggle to formulate expanded measures to help characterize and evaluate poverty and development has also been addressed by other agencies and authors. Enhanced measures include the United Nations Human Development Index and its most recent innovation the Multi-Dimensional Poverty Index (MPI) (Alkire & Santos, 2010; Alkire & Foster, 2011a, 2011b). These indices have been criticized from both social and ecological perspectives (see Berenger & Verdier-Chouchane, 2007; McGillivray, 1991; McGillivray & Shorrocks, 2005; Sagar & Najam, 1998).

**Table 1**  
Data utilized for the graphic presentation.

Analytical frame	Metric
<b>Development Diamond</b>	
Vertex: Welfare	% of households living below an absolute (expenditure-based) poverty line
Employment	% of individuals over the age of 15 reporting paid employment in formal sector wage labor jobs, household microenterprises, or casual labor.
Education	% of respondents completing primary school
Living conditions	% of households with access to piped water and electricity, and living in houses with permanent walls (composite)
<b>Living Conditions Diamond</b>	
Vertex: Infrastructure	% of households with access to <i>any given service</i> across eight infrastructure services (composite)
Unit quality	% of structures with permanent walls
Neighborhood and location	% who feel safe in their neighborhood
Tenure	Ratio of owner-occupiers to tenants
<b>Infrastructure Polygon</b>	
Indicator: Electricity	% of households with in-house electrical connections
Toilet	% of households with access to private toilet facilities
Sewage disposal	% of household with access to sewerage/septic tank/soak pits for sewage disposal
Drain	% of households reporting a working drain
Garbage pickup	% of households with organized garbage pickup services
Public transit	% of households with at least one member using public transit as primary mode of transportation
Phone	% of households with phone service (either land line or cell phone)
Piped water	% of households with access to private piped water connections

But the empirical disconnect between the dimensions—the finding that households could be above the poverty line, have education and a job, but still have poor living conditions (and vice versa)—was surprising and caused us to examine living conditions more closely. The second and third frameworks—the Living Conditions Diamond and the Infrastructure Polygon—deepen the comparative analysis of the two cities. Using these frameworks, we confirm that living conditions and infrastructure access in slum settlements in these two cities also differ dramatically. The frameworks and our findings challenge some conventional perspectives on informal settlements in Africa. They belie the notion that African cities face a more or less similar slum problem. By extension, they challenge the idea that one approach to the upgrading of slums can work in African cities. The frameworks provide a tool that can help practitioners and policymakers better understand local needs and priorities and tailor their interventions.

Our findings suggests that the relationships between key development variables—monetary welfare, employment, education, living conditions, and infrastructure access—are more complex, the direction of causality more tenuous, and the sequence of proposed ameliorative interventions more open than we may have allowed in our understanding thus far. We call for comparative research to test and refine these three frameworks and enhance our understanding of the relationships between key variables. With more robust data, we might begin to explain—not just depict—the variation in slum conditions and facilitate appropriate interventions to reduce poverty and improve the quality of life for millions.

This paper contributes to the literature in three ways. It presents a series of three inter-related analytical frameworks useful for understanding the multiple dimensions of development *within* any given setting—urban or rural, slum or non-slum—and comparing

the situation across settings. It provides a rare empirical comparative snapshot of development in the slums of two cities, and presents statistically robust quantitative data on key selected indicators. Finally, the paper challenges some seemingly logical ideas and inter-relationships in development theory—including the notion that education and jobs will translate into lower poverty and improved living conditions or, conversely, the idea that poor citizens need to have education and employment to access decent living conditions and basic infrastructure.

### Comparative slum settlements research project: brief overview

In February–March 2004, household surveys were conducted in the slums of Nairobi and Dakar. The surveys were part of a broader World Bank-supported initiative aimed at understanding the current lives of slum residents, their living conditions, and the nature of the poverty that they face. The questionnaires administered in the two cities were virtually identical with only small differences in queries in order to reflect local context and terminology. The survey instrument included queries on demographics and household composition (e.g., age, gender, educational attainment), household economic characteristics (e.g., household expenditures, remittances, employment, household enterprises), housing quality, access/performance of infrastructure services, human health, social factors (e.g., civic engagement; incidence of crime), and land tenure security and housing tenure type.<sup>4</sup>

Both surveys represent a population-weighted stratified random sample of slum households: 1755 households in Nairobi, 1960 households in Dakar. In Nairobi, the 1755 households were selected from 88 Enumeration Areas (EAs). For census purposes, Kenya's Central Bureau of Statistics (CBS) has divided Nairobi into about 4700 EAs, of which 1263 as categorized as "EA5." EA5s are characterized by poor-quality, sub-standard housing and poor infrastructure. The 88 EAs in our sample were selected randomly from the subset of 1263 EA5s and weighted by population. A complete re-listing of households was conducted in each selected EA and the sample households were selected randomly from the new lists. Overall, the Nairobi data set is a population-weighted stratified random sample and it is representative of the 1263 EAs categorized as "slums" by CBS.

Similar protocols were followed for Dakar. The Dakar survey canvassed 1960 households randomly selected from a sample of 99 EAs. The 99 EAs were selected randomly from a universe of 2074 "slum" EAs in the city weighted by population. These 2074 EAs came from a 2002 listing of households, and their classification was carried out based on both official and unofficial information on level of past slum upgrading efforts. As in Nairobi, the Dakar data set is a population-weighted stratified random sample representative of the 2074 EAs categorized as slums in that city.

### Nairobi and Dakar: graphical perspectives

We present three different—but inter-related—graphics. The Development Diamond provides an overview and is comprised of four social and physical dimensions commonly associated with social well-being in the broader literature on poverty and

development. The dimensions are: monetary welfare, employment, education, and living conditions. The second framework delves into aspects of living conditions, both because it is the least analyzed of the four dimensions in the development literature, and because initial results for Nairobi and Dakar suggested the need for a more nuanced approach to understanding the large variations in tenure and physical conditions among neighborhoods. The Living Conditions Diamond posits that the quality of living conditions is a composite of four dimensions—infrastructure access, tenure, housing quality, and neighborhood and location—and that these dimensions interact with each other to determine the outcome (Gulyani & Bassett, 2010; Gulyani & Talukdar, 2008). The final framework—the Infrastructure Polygon—digs deeper into the infrastructure dimension of the Living Conditions Diamond. It focuses on residents' access to eight key infrastructure services, explicitly accounting for whether they actually use or rely on the service.

### The Development Diamond

The Development Diamond (Fig. 1) portrays urban slums in these two cities along four dimensions: monetary welfare, employment, education, and living conditions. Conventional wisdom (and development theory) lead us to believe that the dimensions of the Development Diamond interact to determine the welfare of a given community or household and that improvements

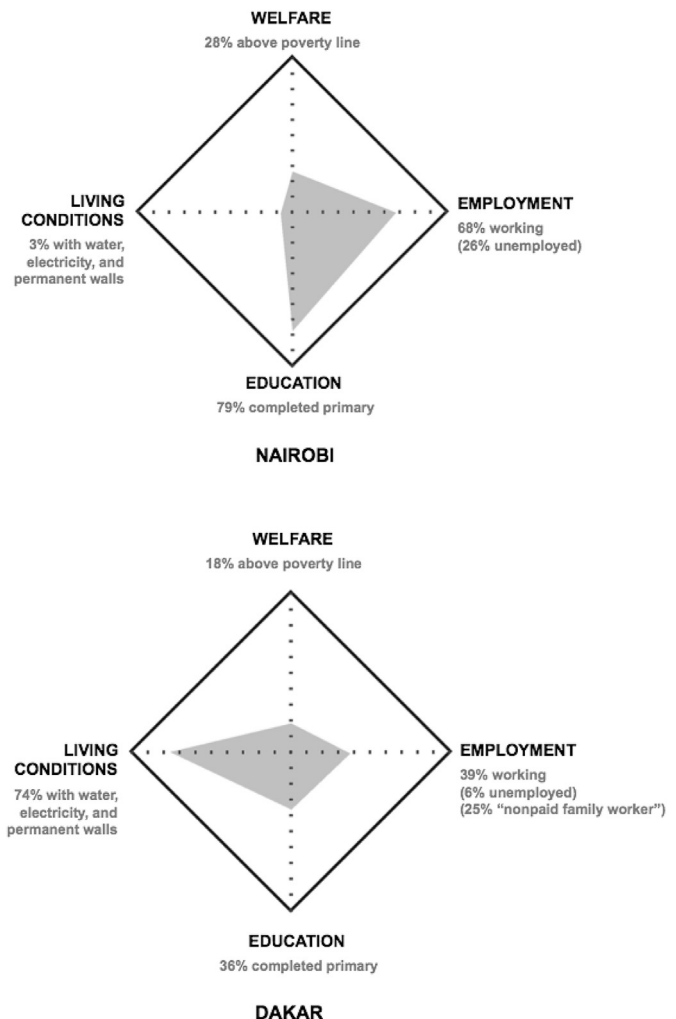


Fig. 1. Development diamonds.

<sup>4</sup> This paper provides an overview of the findings from this data set and is supported by other empirical and theoretically-oriented papers that examine, amongst others, the relationship between monetary welfare, microenterprises and living conditions, as well as providing a theoretical justification for some of the frameworks used in this analysis (authors 2012; Gulyani & Bassett, 2010; Gulyani & Talukdar, 2008; Gulyani, Talukdar, & Jack, 2010).

made over time in one area should spur gains in another. Improvements in education can improve access to more and better jobs; this can lower the incidence of income poverty. With more income, residents can invest in improving living conditions and education levels. In terms of scoring, for each of these indicators we set a normative goal of 100 percent—in optimal circumstances 100 percent of the population would be employed, educated, have sufficient income or expenditure to live above the monetary poverty line, and have decent housing, including access to all basic infrastructure and services. A fully shaded diamond would indicate a city that has eliminated deprivation; such a diamond (and such a city) we acknowledge does not exist anywhere on the globe.

#### *Interpreting the information within and across diamonds*

The first thing to notice from the diamonds is that slums in both cities fall far short of the 100 percent target along each of the four dimensions—poverty is high, unemployment is a serious problem, education is anything but universal, and living conditions are poor. Second, within the diamonds the vertices are not strongly correlated to each other. *A priori* we would have expected that higher educational attainment would be correlated with higher employment and lower poverty incidence. Similarly, we would have expected that a high poverty rate and low levels of labor force participation would be correlated with poor living conditions, but this does not seem to be the case in Dakar. Third, when we compare the diamonds, the only commonly shared dimension is the high incidence of monetary poverty—slum settlements in the two cities diverge greatly in their performance on the other three dimensions. Employment levels and educational achievement are high in Nairobi; they are quite low in Dakar. Despite this, living conditions in Dakar's settlements are superior to those experienced by Nairobi residents.

#### Monetary welfare: poverty rates are high in both Nairobi and Dakar

As shown in Fig. 1, poverty rates—as defined by the proportion of households living below an absolute (expenditure-based) poverty line—are extremely high in both locations.<sup>5</sup> In Nairobi, the analysis took the 1999 poverty line as defined by the Government of Kenya and adjusted it for inflation to calculate the poverty threshold for 2004. Using an expenditure-based poverty line of Ksh 3,174 (US\$42) per adult equivalent per month, excluding rent, about 72 percent of the slum households are poor and 28 percent are non-poor. In Dakar, the 2004 official poverty line was 27,705 F CFA (US\$53) per adult equivalent, including rent. The discrete wealth indicator suggests that about 18 percent of the households have expenditures above the poverty line, while about 82 percent fall below the poverty line.

#### Employment: labor force participation is higher in Nairobi than Dakar

Employment—as measured by the number of individuals over the age of 15 reporting paid employment in either wage labor jobs

or microenterprises—differs greatly in the two cities. In Nairobi, 68 percent of respondents said they had some type of paid employment—be it a regular wage job, casual work, or self-employment. Only 39 percent of Dakar's residents indicated employment across those categories. Regular wage jobs provide the most notable difference between the two cities with 25 percent of Nairobi respondents but only 8 percent of Dakar residents indicating that they held such positions. Self-employment or work in household-owned microenterprises is prevalent in both Nairobi and Dakar, where about one in five report that they work in their own household microenterprise. Nairobi's slum residents also report the highest level (24 percent) of casual employment, far outstripping the 8 percent of Dakar residents reporting similar employment.

In contrast to the reported employment figures, in Nairobi the unemployment rate reported by respondents was 26 percent, a much higher figure than the corresponding 6 percent figure for Dakar. This seems paradoxical—how can a place have both low employment and unemployment levels? Part of the explanation lies in the number reporting unpaid work—in Dakar, 25.2 percent of the respondents report their occupation as a “nonpaid family worker” (as compared to 0.4 percent in Nairobi). Additionally, Dakar's slum residents are older on average than Nairobi's. This is reflected in a far larger cohort of residents reporting that they were retired or disabled (and out of the job market) in Dakar than in Nairobi (12.7 versus 1.1 percent respectively). Social context matters—there seem to be different notions in the two cities as to what constitutes employment, as well as different parameters affecting who can or should be considered part of the labor pool.

#### Education: high rate of primary school completion in Nairobi relative to Dakar

Educational attainment—measured here as the completion of primary and high school—also varies markedly. In Dakar, only about a third of adults have a primary-level education, and fewer than 10 percent have completed high school. School completion rates are much higher in Nairobi with 79 percent of slum residents having completed primary school and 31 percent high school. Given the fact that Kenya introduced free primary education in 2003 and our survey recorded a 92 percent enrollment rate for school-age children in Nairobi's slums, Nairobi could be on its way to even higher levels of educational attainment.

#### Living conditions: good in Dakar, but appalling in Nairobi

The final vertex of the Development Diamond measures living conditions through one composite indicator: the percentage of households with access to piped water and electricity who also reside in a house with permanent (e.g., stone, cement) external walls. The selection of these three combined indicators is purposeful: extension of piped water and electricity networks requires a significant public investment, while permanent walls are a prime indicator of housing quality. Since it takes time (and political support) for public utilities to extend these services to informal settlements, they are good predictors of settlement consolidation. Similarly, structures with permanent walls are a proxy for both housing and settlement consolidation.

Fig. 1 shows that, along the living conditions dimension, Dakar leads by a sizable margin—74 percent of Dakar's slum households have access to piped water and electricity and live in houses with permanent walls. This is true of only 3 percent of the slum households in Nairobi. Further analyses show that, in regards to the infrastructure measurements alone, only about 3 percent of Dakar slum households have neither service. In Nairobi the number of

<sup>5</sup> While income and expenditure underpin a household's economic life, they are notoriously difficult to measure. Respondents see little gain and perhaps some risks in revealing real income, or they may not remember and aggregate their numerous transactions. With these concerns in mind, the surveys in Dakar and Nairobi employed three approaches to estimate monetary welfare. The first approach consisted of an assessment of household expenditures above or below the poverty line. Enumerators calculated a household-specific poverty line based on the age and number of household members, respondents answered whether expenditure was above or below that threshold. The second measure focused on total household expenditures adjusted for family size (measured in adult equivalents) and the third and final measure calculated total household income adjusted for family size (also measured in adult equivalents).

households who lack access to both services jumps to about 66 percent. The measure for permanent housing is similarly divergent: 12 percent of Nairobi residents have external walls made of brick, stone or block whereas 89.3 percent of Dakar residents live in such structures.

### Discussion

The contrast between the two cities is striking and puzzling. Why do the people of Dakar—who have such low levels of educational attainment and paid employment—enjoy good living conditions? Why, in contrast, do residents of Nairobi—who have higher levels of education and a more robust employment status relative to Dakar—suffer from such deprivation at home? The Development Diamond clearly suggests that the link between education, employment and an improved standard of living is not as robust as development theory would suggest. Reductions in income poverty and improvements in human development do not seem to automatically translate into improved infrastructure access and quality of living conditions for the urban poor.

A question that arises is whether the indicator that we used for the Living Conditions vertex is a poor proxy and/or is misrepresenting quality in the two cities. To examine this more closely, the Living Conditions Diamond was formulated; it shows that this is not the case and that the snapshot provided by the Development Diamond is representative.

### *The Living Conditions Diamond*

The second graphical method for evaluating slum settlements in these two cities is dubbed the Living Conditions Diamond (LCD). Although the term “slum” generally evokes images of squalor, we know that the slums of the developing world are extremely diverse places—characterized by great differences in housing quality, access to infrastructure and urban services, levels of crime, etc. To document and compare these heterogeneous places, the LCD disaggregates living conditions along four vertices of a diamond: infrastructure, unit quality, neighborhood condition and location, and tenure. Elsewhere we have argued that these four factors interact with and influence each other with changes in one area affecting change in others (see Gulyani & Bassett, 2010 for a theoretical discussion and Gulyani & Talukdar, 2008 for a detailed empirical application). For example, an improvement in infrastructure can create incentives for increased investment in housing—construction of reliable storm-water drains can incentivize permanent house construction if the threat of erosion is abated. Likewise, an improvement in tenure status can trigger new public and private investments—formal recognition by the state of an unauthorized housing settlement reduces the risk of demolition and increases the incentives for individuals to invest in upgrading their housing. It also permits or even obligates public utilities to invest in trunk infrastructure for urban services.

The Living Conditions Diamond does not have uniform standards or goals. While we can argue for a normative standard for most infrastructure (e.g., 100 percent of residents should have access to potable water), other parts of the diamond, such as tenure and neighborhood condition/location, do not lend themselves to this kind of rating. A settlement with 100 percent owner-occupiers cannot be asserted to be better than a 50/50 mix of owner-occupiers and tenants.

While there are multiple indicators that could be graphed in Fig. 2, for simplicity we have opted to graphically plot *only one proxy indicator or index* for each of the four dimensions. We use the following indicators: the percentage of households with permanent walls (a proxy for unit quality); percentage who own their

home (a measure of tenure); percentage who feel safe in their neighborhood (a proxy for neighborhood conditions and location); and a composite infrastructure index (average access or connection rate across eight different infrastructure services).

### *Interpreting the information within and across LCDs*

In sharp contrast to the Development Diamond, the four vertices of the Living Conditions Diamond do appear to be correlated with each other. As the shading in Fig. 2 illustrates, unit quality, infrastructure access, tenure and neighborhood conditions appear to move in tandem in these two cities. In comparing the diamonds, it is clear that living conditions in Nairobi are vastly different from those of Dakar, as was indicated in the Development Diamond. Infrastructure access, housing quality, and perception of safety are much lower in the Nairobi’s slums. The tenure situation is also quite different with the slums of Dakar characterized by high levels of owner-occupancy. Nairobi’s slums are populated by tenants.

### Infrastructure: Nairobi lags Dakar in access

The first vertex of the LCD focuses on basic infrastructure services, which are an essential component of quality of living conditions. Roads, public transport, electricity and telecommunications are critical for economic activity; infrastructure facilitates delivery of other services such as public safety and fire protection. Potable water, sewage disposal, and garbage collection are fundamental for maintaining human health. Data were collected on eight services, namely water, electricity, toilets, sewage disposal, drainage, garbage collection, public transport, and telephone services.

In the Living Conditions Diamond, we display a composite score of infrastructure access across eight services. What this figure shows is the average percent of households with access to *any given* service. Nairobi slum residents once again have far lower average rates of access (only 20 percent) than Dakar residents (60 percent).

### Condition of housing units: Dakar housing is superior, but crowding is comparable

Dakar’s housing stock is much better than that of Nairobi. About 96 percent of the houses in Dakar’s slums—but only 12 percent of those in Nairobi—have external walls constructed with permanent materials. In Nairobi the most common building material used for walls is rudimentary, namely mud and wattle.<sup>6</sup> Dakar and Nairobi also have notable differences when it comes to number of persons per room. The mean number of rooms per household is significantly higher in Dakar (4.1) than in Nairobi (1.2); this appears to reflect the fact that the mean household size in Dakar (9.6) is about three times larger than that in Nairobi (3.0). Crowding levels—the average number of persons per room—are comparable across the two locations: 2.8 in Dakar and 2.6 in Nairobi.

### Neighborhood condition and location: Safety a concern in both cities’ slums

To assess the neighborhood and its location, Fig. 2 utilizes one proxy indicator, namely whether slum residents feel safe in their neighborhood. The majority of slum residents in both cities report that they feel unsafe in their own settlement. When asked if they feel safe in their settlement, only 48 percent of Dakar’s slum

<sup>6</sup> Building foundations are, likewise, poorer in Nairobi: about 32 percent of households in Nairobi’s slums have dirt floors; the corresponding figure for Dakar is only 10 percent. Full data for this analysis is contained in tabular form in Gulyani et al. (2010).

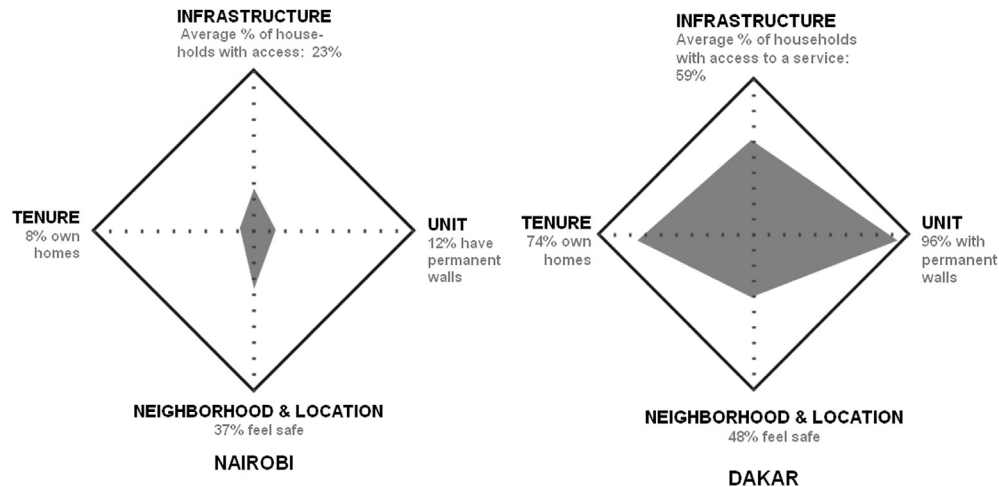


Fig. 2. Living conditions diamonds.

residents and 37 percent of those in Nairobi answered in the affirmative. Crime and safety is only one potential indicator that could be used to tease apart neighborhood characteristics. Others might include: amenities (e.g., open space), locational advantages (e.g., centrality), site vulnerability (e.g., hazardous waste exposure), presence of an access road, and availability of schools and health centers.<sup>7</sup>

Tenure mix: Nairobi—predominantly renters; Dakar—owner-occupants

The tenure mix—defined as the ratio of owner-occupiers to tenants—also differs greatly. As is illustrated in Fig. 2, homeownership is extremely low in Nairobi—only 8 percent of households say that they own their house. In Dakar, about 74 percent are owner-occupiers and 26 percent are tenants. The duration of stay in a given settlement is low in Nairobi and high in Dakar. Median stays in their current house and slum settlement are three years and six years respectively for Nairobi households, compared to 17 and 20 years respectively for Dakar households.<sup>8</sup>

Discussion

The results clearly suggest that the vertices—especially tenure, unit and infrastructure—are strongly linked to one another; the question is what influences this directionality and is any single factor paramount? The literature on slum upgrading has long stressed the importance of tenure security to settlement quality (see, for instance, Durand-Lasserve & Royston, 2002; Mayo, Malpezzi, & Gross, 1986; Werlin, 1999). Looking at directionality of three of the factors (housing unit, tenure, infrastructure), we might conclude that better physical outcomes (better unit quality, greater infrastructure access) are related to tenure, namely the

higher level of owner-occupancy and stability of Dakar's settlements. The deplorable physical conditions in Nairobi, in turn, might be related to the constant turnover of tenants and low levels of owner-occupancy in that city's settlements. If true, it suggests that efforts to improve physical conditions in Nairobi's slums may need to start with the tenure dimension rather than with physical investments. One option would be to strengthen the stake that the tenants have in improving their housing and neighborhood—for example, by facilitating purchase by or transfer of units to willing tenants. Yet another and very different approach to improving housing stock in Nairobi's slums could be regulatory in nature—passing tenants' rights laws and enforcing building codes that fine owners for operating sub-standard housing rentals. However, because the state is largely complicit in slum development in Nairobi, political advocacy and legal action are ultimately needed to address deficient infrastructure provision as well as inequitable land distribution and access (Howden, 2012).

*The infrastructure polygon*

The infrastructure vertex of the Living Conditions Diamond is just a composite. To understand infrastructure provision better—especially variation in access and level of service within and across cities—we developed the Infrastructure Polygon. We asked households about their access to eight different infrastructure services. Only those households who reported both that they had the service or infrastructure, and also that it worked well enough for them to use it as their primary source were recorded as having access. The results are graphically presented in the form of a polygon where each vertex represents one type of infrastructure service, and the score on it represents the proportion of households that have access to that service (Fig. 3). A normative standard for evaluating services can be established—access for each of these eight services should be nearly universal.

*Interpreting the information within and across the polygons*

The partial shading in the Infrastructure Polygons shows that neither city offers anything approaching universal access to basic services for its slum residents. Looking across services, the Polygon illustrates that performance differs dramatically across infrastructure sectors within a city. It shows that in Dakar about 84 percent have private piped water connections but only 5 percent benefit from drainage infrastructure. Comparing the two Polygons, it is clear that households in Dakar's slums are systematically and

<sup>7</sup> With respect to the latter two measures, the data are as follows. In both Nairobi and Dakar, 89 percent of slum households report that they have health-service facilities in their settlements. We also find that schools in general, and private schools in particular, are located throughout the slums, although Nairobi has a slight edge over Dakar with about 88 percent of slum households in Nairobi indicating that they have public or private school facilities in their settlements compared with about 75 percent in Dakar.

<sup>8</sup> For Nairobi, the mean figure for duration of stay in current home is 4.9 years, whereas the mean for current settlement is 8.8. For Dakar, the mean duration of stay in current home is 18.7 years with current settlement at an average of 20.8 years.

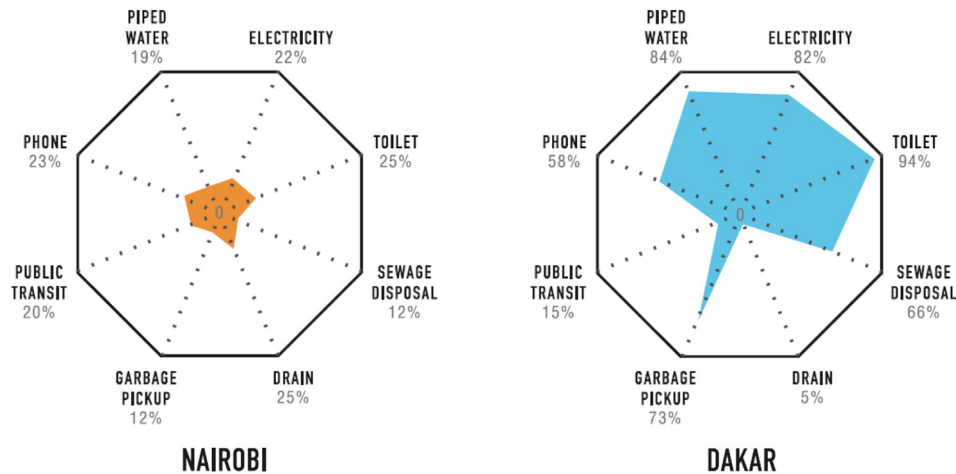


Fig. 3. Infrastructure polygons.

significantly better off than those in Nairobi. In terms of water and electricity connection rates, Dakar leads Nairobi by a factor of four. We highlight the service-specific findings below to provide insights on, first, the types of informal options the unserved are forced to rely on, and, second, some of the implications of poor access/service.

#### Electricity and street lighting: it's dark in Nairobi—inside and out

The electricity connection rate in Dakar's slums is an impressive 82 percent. By contrast, only 22 percent of Nairobi's slum households have electricity connections. To compensate for lack of access to electricity, 77 percent of Nairobi's slum residents use kerosene/paraffin as their primary source of home lighting, whereas only 5 percent of Dakar's slum residents report using kerosene/paraffin for lighting. In Dakar, 59 percent of slum households report that they have streetlights in their neighborhoods compared with only about 14 percent in Nairobi. These findings suggest that electricity supply infrastructure—transmission and distribution networks—is more established in Dakar's slums than in Nairobi's.

#### Toilets: crowded public toilets in Nairobi; uncrowded and private in Dakar

Dakar's slum households have better access to toilet facilities with 94 percent of respondents indicating they had access to a toilet located either within a house or in the household's compound. Only 25 percent of Nairobi households had a similar standard of service. Nairobi's slum residents rely upon public toilets (60 percent of all respondents.) These toilets are used by an astonishing number of households compared to Dakar—in Nairobi an estimated 19.1 households share a toilet facility compared with 1.4 in Dakar. Even after accounting for the difference in mean household size, we find that on average about 13 people use one toilet in Dakar, while the figure in Nairobi is an appalling 57 people per toilet. About 6 percent of Nairobi slum households report they have no access to toilet facilities. They resort to the bush or a wrap-and-throw option described as “flying toilets” (Njeru, 2006.)

#### Sewage disposal: not many sewers; reliance on septic tanks and latrines

Levels of access to safe sewage disposal (defined as access to sanitary sewers, septic tanks or soak pits) are also divergent with

only 12 percent of Nairobi residents and 66 percent of Dakar's residents reporting such services in their settlements. In Dakar, sewage disposal is through septic tanks and ventilated-improved-pit (VIP) latrines, with about 80 percent of the households reporting that they use one or the other. Nairobi's slum residents rely upon *unimproved* pit latrines (64 percent of respondents).

#### Drainage: drains—either not present, or not working

The two cities differ in regards to storm-water drainage. Nairobi settlements have a more extensive network of drains than Dakar with about 58 percent of Nairobi slum households reporting some kind of drain outside their house; only about 7 percent of Dakar households report the same. Respondents were asked whether the drains in their settlements worked. Of the subset of households with drains outside their homes, only about 44 percent in Nairobi reported that they worked properly most of the time, compared with about 75 percent in Dakar. Although Nairobi's slums certainly have a more extensive drainage network compared with Dakar, this network is not well maintained—the net result is that overall only 25 percent of Nairobi's slum residents have a working drain outside their home. Nevertheless, this is one area in which Nairobi outperforms Dakar—only 5 percent of Dakar's residents have a working drain outside their house.

#### Garbage: organized collection services in Dakar, neighborhood dumping in Nairobi

Access to solid-waste removal services is reasonably high in Dakar but almost non-existent in Nairobi. About 73 percent of Dakar's slum households have some form of an organized garbage collection system, compared with only 12 percent in Nairobi. Of this 12 percent, private collection is a central part of that system, accounting for 11 of that 12 percent. For Dakar, 70 out of the total 76 percent of slum households with access to organized collection systems depend on city/municipal collection systems. For households without access to an organized garbage disposal system, the predominant method is “dumping in the neighborhood” in both cities.

#### Use of public transit: slum residents walk

Use of public transit is low in both cities with only 20 percent of slum households in Nairobi and 15 percent of those in Dakar reporting that at least one person in the household uses such

services. The typical slum resident, in either city, relies upon his/her feet for transportation. This is especially true for Nairobi where walking is the primary mode of transport for majority (55 percent) of Nairobi slum residents with only about 20 percent using motorized public transportation. In Dakar, walking is also the most common form of transport with about 40 percent of residents using their feet as their primary transportation mode; about 16 percent use public transportation. Use of motorized public transportation is low and this seems to reflect a combination of constraints—gender or financial constraints at the household level and infrastructure or service constraints at the settlement level.

#### Phones: mobile phones trump landlines everywhere

Fig. 3 reports overall access to telephones, both landlines and mobile phones. A greater proportion of slums residents in Dakar, compared to those in Nairobi, report access to telecommunication services. Overall 58 percent of Dakar's residents have access to one or more of those services; in Nairobi the figure is 23 percent. Disaggregated by type, about 29 percent of Dakar's slum households have working landlines telephones, but this service is negligible in Nairobi where only 0.2 percent of slum residents have landlines. The communications story lies in the expanding use of mobile phones. By a significant margin in both cities, access to mobile phones outstrips landlines. Dakar's slum residents reported higher access—50 percent of households in Dakar have a mobile phone compared to about 20 percent in Nairobi.<sup>9</sup>

#### Piped water: private connections versus kiosks

Access to piped water connections—in-house or a yard tap—is remarkably high in Dakar (84 percent) and quite low (19 percent) in Nairobi. In Dakar, the vast majority of slum residents use private piped connections as their primary source of water. In Nairobi's slums, water kiosks are the prevalent primary source—64 percent of slum households buy water by the bucket (or 20-liter Jerri can).

#### Discussion

The infrastructure polygon upholds and deepens the understanding of slum conditions obtained from the Development Diamond and the Living Conditions Diamond. Access to infrastructure services is superior in Dakar and exceedingly poor in Nairobi, with the sole exception of drainage. Because coverage rates in many (but not all) infrastructure sectors are similar in each city (between 10 and 25 percent for most services in Nairobi, and 70–84 percent for most services in Dakar), the Infrastructure Polygons for Nairobi and Dakar seem to suggest that there is a large city effect, and that it overwhelms (or challenges) any sector-specific explanations for superior service in Dakar relative to Nairobi.<sup>10</sup> There is paltry public investment to meet the needs of Nairobi's slum residents, whereas in Dakar public administrators have fulfilled their service obligations more equitably.

<sup>9</sup> These data are for 2004; cell phone access has expanded dramatically across Sub-Saharan Africa in both rural and urban areas so we expect access rates in the continent's slums have almost certainly improved as well (Ballard, 2009).

<sup>10</sup> This finding is particularly interesting because it brings into question at least one long-standing notion—the idea among water practitioners in Africa that the massive expansion in water supply coverage in Dakar can be attributed to good performance by a privatized water utility with access to a well-designed connection subsidy program from government (personal interviews with water practitioners working on and in Senegal, including World Bank staff, 2005 and 2007). If so, then how would we explain the equally large expansion in electricity coverage by the publicly owned national electric utility and the good coverage for municipal services?

The Polygon also highlights sectors in which services are particularly deficient—if combined with additional analyses, it can be used to plan future interventions and investments. In Dakar a separate research team conducted follow-up research to ascertain whether the 5 percent rate of access to drains was indeed an area of concern. The researchers found that the lack of drainage infrastructure in Dakar seriously compromises the potential gains from improvements in other services as many neighborhoods, especially those in low-lying areas, flood often and extensively. In Dakar, then, poor drainage appears to be the biggest challenge to settlement quality and if left unaddressed could undermine other advantages identified. Addressing drainage deficits is a sensible first action—although for some of the very low-lying settlements, relocation may be the better long-term solution. The Nairobi analysis shows a few possibilities for intervention in infrastructure—these must be formulated to work within the parameters set by tenure and duration of stay (Living Conditions Diamond) and income levels (Development Diamond). Short-term actions in Nairobi could include organizing garbage collection services paid for by user fees or the rehabilitation of drains—either as a community project or as a local government initiative—to ensure their functioning. Other actions—such as investing in a water supply system that allows in-house connections or sewerage—are likely to result in higher rents that may hurt current tenants by reducing affordability, while creating additional profits for Nairobi's absentee landlords.

#### **Conclusions**

This paper tells an empirical tale about the conditions facing slum residents in Nairobi and Dakar. Using a simplified set of three frameworks drawn from a rich data set, we graphically illustrate multiple facets of the nature of poverty and living conditions in the slums of these two African capital cities. At the most macro-level—the perspective provided by the Development Diamond—the depiction shows some level of shared deprivation with slum residents in both cities experiencing monetary poverty. This same analysis indicates that the cities diverge significantly in relation to employment levels, education, and living conditions, with Nairobi's relatively well-educated and employed residents suffering from poorer living conditions than residents of Dakar, who report much lower levels of educational attainment and paid employment. The Living Conditions Diamond further illustrates the dramatic gaps between these slum neighborhoods—with Dakar residents enjoying greater access to infrastructure and services, higher quality housing, and higher levels of homeownership. The final disaggregated evaluation of the infrastructure vertex of the LCD—displayed on the Infrastructure Polygon—thoroughly confirms the level of deprivation in Nairobi relative to water access, sanitary services, electricity, rubbish removal, etc.

The lived experience of being a slum resident in the developing world differs greatly at least across the two cities that we have studied. While these frameworks help us to assess and depict levels of development, living conditions and infrastructure access, a chief limitation is that they do not explain *why* the conditions are the way they are. Slum heterogeneity raises an important set of social science questions: How do variations in poverty and human capital relate to variations in urban infrastructure? What institutions mediate this relationship? What lessons do better served places offer to places still struggling to meet basic needs? Clearly more research is necessary before we can answer these questions with any certainty.

Our paper contributes both methodologically and theoretically. We have argued that there is need for an understanding of slums at the meso-level, that is, an understanding that is not as reductive as



percent of population living in slums, nor as detailed as an ethnographic account of an individual slum over time. Our three frameworks—which present statistically robust quantitative data on selected indicators—provide one approach to understanding and evaluating slums in a multi-dimensional manner. These three inter-related frameworks are also useful for understanding the multiple dimensions of development *within* any given setting—urban or rural, slum or non-slum—as well as for comparing the situation *across* settings. A better understanding of development dynamics as well as local conditions is central to actions of policymakers charged with improving livelihoods and welfare outcomes for urban residents. The Development Diamonds for Nairobi and Dakar suggest that if policymakers had to choose just one intervention in each city, they would be well advised to focus on improving living conditions in Nairobi and concentrating on increasing educational attainment in Dakar.

Finally, in narrating the story of these two cities using the three frameworks, the paper challenges fundamental, seemingly logical ideas and inter-relationships in development—in particular, the notion that education and jobs will translate into lower poverty and improved living conditions or, conversely, the idea that poor citizens must have education and employment before they can have access to decent living conditions and basic infrastructure. In both these cities neither human capital nor income appear to fully explain the observed variation in infrastructure access and comparative living conditions. This finding brings into question the idea that reduction in income poverty is sufficient to improve the lives of slum residents.

Demographic projections for the developing world indicate that future generations will live mostly in cities. To effectively plan for a future where cities are prosperous, sustainable, and inclusive, we need to understand clearly where they are today, which cities are performing well and offering better opportunities to their residents, and why. Evidently more comparative research on urban outcomes and their underlying causes is needed. To effect this, we need good data drawn from many cities, optimally over the course of time. While difficult, such data can be collected—it requires resources from and prioritization by national governments and international agencies as well as data sharing and collaboration across research networks. Empirical work must be complemented by richer theoretical perspectives. Our understanding of what drives settlement conditions is still surprisingly undeveloped. We know that institutions matter and changes to the legal/institutional landscape can play a role in the improvement of settlement conditions. But the discussion of institutions has been simplified—reduced to acrimonious debates about the role of property rights and tenure (e.g., Gilbert, 2002; McGranahan, Mitlin, & Satterthwaite, 2008; de Soto, 2000; Varley, 2002). There must be other institutions that affect settlement outcomes and improvement. Clearly, then, we need to tell some more tales—of Accra, Mumbai, Manila or Lima to name a few—if we wish to arrive at a useful understanding that can help improve the lives of all urban residents.

## Acknowledgment

The authors wish to thank the anonymous reviewers for their helpful comments. We are also grateful to the World Bank for the data underlying this work and for supporting some of the analytical work. However, the views expressed here are neither attributable to nor necessarily shared by the World Bank.

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