

# Exploring the Spatial Distribution of PLWA in Nairobi City

Moses Murimi NGIGI

## ナイロビにおける PLWA の空間的分布

ギギ、モセス・ムリミ

### Abstract

発展途上国においては、都市の急激な成長によりインフラ整備や人口増加率、貧困層の分布、環境の悪化など、様々な社会的格差が発生しており、HIV/AIDS の流行が空間的に極めて不均一となることが懸念されている。本研究は、エイズと共存する人々 (PLWA) に対する調査により、ナイロビにおけるエイズの流行の空間的な特性を示すものである。PLWA の分布とナイロビ住民の人口密度や社会・経済的属性との関係を、GIS を用いて分析した。その結果、ナイロビの複雑な都市構造が明示された。また、人口密度の高い地域では、PLWA が多くなる傾向にあることが明らかとなった。ただし、GISを援用した分析だけではエイズの空間的分布の特性とナイロビ住民の社会・経済的属性との関係を明確にできず、さらなる調査方法の検討が必要である。

**Keywords:** HIV/AIDS (エイズ), PLWA (HIV/AIDS 感染者), spatial distribution characteristics (空間的分布の特性), Nairobi city (ナイロビ)

### 1. Introduction

Emphasis on regional and national differentials in prevalence of HIV often conceals substantial within-country variation in the burden of the AIDS epidemic (Zulu, E.M et al. 2004). Surveillance data from variety of sources has shown that urban areas have higher HIV prevalence rates than rural areas. HIV sentinel surveillance in Kenya has also shown the prevalence to be higher in the urban areas as compared to the rural (see Figure 1). In 2004, HIV surveillance results for Nairobi city, also an administrative province, were second after Nyanza, among the eight administrative provinces of Kenya. It was also estimated that about 40% of the urban adult population infected with HIV/AIDS in Kenya resided in Nairobi.

Nairobi, similar in characteristic to other African cities; high population growth rate, high unemployment levels, urban poverty, high population densities, and heterogeneous population from different cultural backgrounds present a scenario where the HIV/AIDS pandemic can vary in many ways. Understanding the spatial aspect of the AIDS epidemic within Nairobi is important in the fight against the spread and also for the welfare of the people living with HIV/AIDS (PLWA). Where then are the people living with HIV/AIDS within Nairobi? What are the factors that contribute to their spatial distribution? Is there any relationship between the urban structure of Nairobi and the distribution of the PLWA? This paper presents the results of a survey

whose objective was to identify the spatial characteristic of the HIV/AIDS epidemic in the city of Nairobi. Using the visualization strength of geographic information systems (GIS), the residential distribution pattern of the PLWA is analysed against the density and socio-economic profile of the city's population.

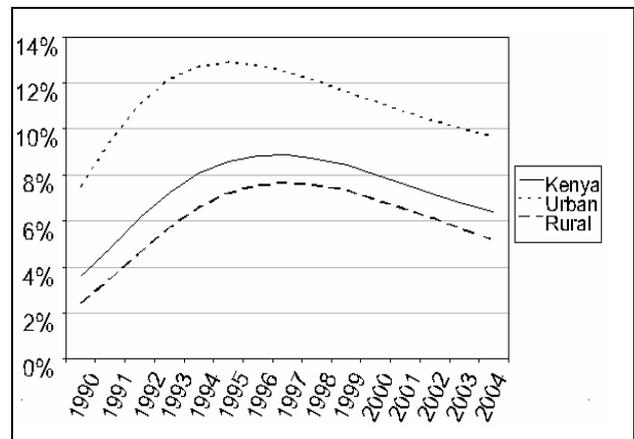


Figure 1: HIV prevalence rates for adults (15-49 years)  
Source: Kenya HIV/AIDS Data Booklet, NACC, 2005

### 2. Study Area

Nairobi is Kenya's principal economic and cultural centre and one of the largest and fastest growing cities in Africa. It is located at the heart of Kenya, mid-way along the main road and railway transportation line linking the port city of Mombasa to the lakeside city of Kisumu, and to Uganda, Rwanda, Burundi and eastern part of DR Congo. Nairobi has currently a population of about three million people distributed among its eight administrative

Moses Murimi Ngigi

305-8572 茨城県つくば市天王台 1-1-1

筑波大学大学院

生命環境科学研究科 地球科学専攻

Tel:029-853-5696

Email: s0430631@ipe.tsukuba.ac.jp

divisions. Its population density varies widely within the city. High-income locations have average densities as low as 500 people per square kilometre while low income locations such as those in the slums have densities as high as 74, 000 people per square kilometre. More than half of Nairobi's residents are crowded in unplanned and inadequately serviced settlements, which expose them to all kinds of health risks, including HIV/AIDS. Among all the other urban centres, Nairobi, attracts the highest number of migrants; labourers, prostitutes, and sexually active adults. With HIV being transmitted mainly through sexual relationships, the link between urbanization and urban mobility, especially commercial sex and partners from variety of origins, makes Nairobi's population very susceptible. HIV surveillance has shown Nairobi to have high and stable prevalence. Figure 2 below shows the prevalence trend of the four sentinel sites in the city that have had continuous surveillance data since 1990.

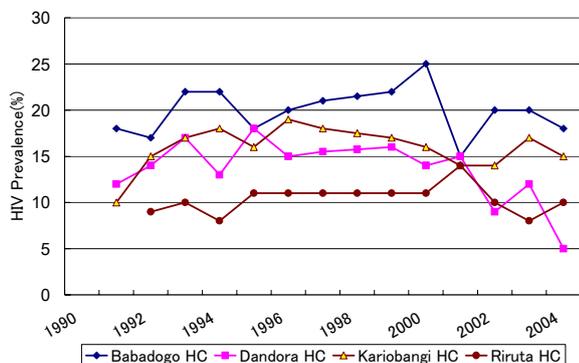


Figure 2: HIV prevalence trend for the four sites in Nairobi having surveillance since 1990  
 Source: Plotted from data from NASCOP publications  
 Note: 1997 & 1998 values were missing; values used are by linear interpolation

### 3. Data and Methods

Rising numbers of PLWA since the start of the HIV/AIDS epidemic in Kenya in 1984 has led to the formation of AIDS support groups. In these support groups, the PLWA share experiences and assist each other psychologically and materially in order to cope with the trauma and hardships that HIV/AIDS has inflicted upon them. Assistance and other support to the PLWA by the government, non-profit making organizations, as well as by individuals are channelled through these self-support groups. Through an umbrella organization networking PLWA support groups in Kenya, fourteen such groups within Nairobi were contacted for this research work. A survey through a semi-structured questionnaire and interviews was conducted; about 230 PLWA who were members of the support groups were reached. The survey sought to find out the PLWA's residence in the city at the lowest administrative unit possible, a description of the socio-environmental conditions of the residence and its environs, personal

characteristics such as occupation, income, educational level attained, gender, religion, and place of birth, migration history, and HIV infection history in terms of place of infection among other qualitative questions.

Population and housing census data for 1999, together with poverty estimates data for the same period were used to present the urban structure. The census data variables that were found good for this research to distinctly depict Nairobi's heterogeneous urban structure were: population density, percentage of the persons living under the urban poverty line (Ksh. 2,648) for 1999, distribution of households by: main source of lighting, main source of cooking fuel and type of housing floor finish. Using ArcView GIS 8.3, the residence of the PLWA was mapped at the location (ward) level and overlain to the above data for visual analysis.

## 4. Results

### 4.1. General characteristics of the PLWA

88 % of the interviewed PLWA resided within the city border. 72% were women, while, men were 28%. In terms of marital status, 31% were in monogamous marriage, 25% were widowed, 22% were divorced or separated, 19% single, and 3% in polygamous union. 20% of the interviewed were not in any form of labour or occupational engagement, 26% were engaged in commercial activities, 15% were in the skilled, clerical and semi-professional jobs, 13% were in semi-skilled and unskilled occupation, 10% were in HIV/AIDS related social and volunteer-based service, while 3% were professionals; 4% did not indicate their occupations. The occupations did not exactly tally with the income. Most of the occupational engagements, such as the unskilled and semi-skilled were erratic and temporary, while the commercial activities were mostly petty trading with very low income. 21% of those interviewed claimed to have no income at all, and depended on assistance from the support groups or on their partners, 44 % earned less than Ksh. 5000 (US\$ 68), 26% earned between Ksh. 5000 and Ksh. 10,000 (US\$ 68~US\$ 136), 4% earned between Ksh. 11,000 and Ksh. 15,000 (US\$ 150~205), 3% between Ksh 16000 and Ksh 20,000 (US\$ 219~274), and only 2% earned above Ksh 20,000(US\$ 274).

### 4.2. The Urban Structure of Nairobi

The variables chosen from the population census data depict the heterogeneity of the city structure when mapped at the ward level. Population density vary a lot, some very small wards where informal settlements are located, have staggeringly high densities. The density of population living below the urban poverty line follow similar distribution pattern, with concentrations in the Central and Makadara divisions, Kibera location two of its neighbours in Kibera division, and in neighbouring locations of Kawangware and Kangemi in Dagoretti and Westlands divisions respectively. The distribution of households residing in houses with earth as the main type of floor finish shows the wards where slums and

informal settlements are located. Main source of lighting and cooking fuel helps to clearly identify the affluent locations in the northern and western parts of the city. (See Figures 3-5)

### 4.3. The Spatial distribution of the PLWA

The PLWA were spatially spread across all the eight administrative divisions of the city (see Table 2). 51 were from Kibera, 36 from Dagoretti, and 33 from Embakasi, and the least (2) were from Westlands division. The PLWA rates per 100,000 people shows Kibera to be leading with 96, followed by Makadara and Dagoretti, then Pumwani and Embakasi, Central, Kasarani, and the least being Westlands with 5 cases per 100,000.

**Table 1: Distribution of interviewed PLWA by division of residence**

Division	PLWA Interviewed	
	Count	rate per 100,000
Central	24	31
Dagoretti	36	52
Embakasi	33	39
Kasarani	11	25
Kibera	51	96
Makadara	24	53
Pumwani	19	41
Westlands	2	5
TOTAL/AVR	200	42.75

The residence could only be identifiable to the location (ward) level, as many could not clearly indicate their residence to the lowest census enumeration unit. This was good enough as the population and socio-economic data available could be used to show the urban structure at an adequate level of disaggregation. The PLWA originated from 29 out of the 49 locations of the city. Figure 3 shows this residential distribution against the population density. Kibera location in Kibera division had the highest rate, followed by Makadara, then Eastleigh South, and Kawangware locations. These are low income-high density areas, and also happen to be location of some of the big slums in the city. Surprisingly, a medium density location, Langata, had a high rate of 25; this could be explained by its closeness to Kibera location where many PLWA support organizations operate.

Figure 4 shows the spatial distribution of the PLWA against the percentage households using electricity and tin-lamp as the main source of lighting, and also against electricity and paraffin as the main cooking fuel. Use of tin-lamp is a proxy of low income, as there are other alternative sources of light such as pressure lamps and lanterns, but cost much more than the tin lamps. The

relationship between the PLWA distribution and the main source of lighting is obscure as the use electricity use is widely spread across all wards, and there were some notably deprived locations where tin-lamp was the main source of light, but the survey did not access any PLWA from these. Locations with more than 77% of the households using electricity as a source of light had low or no case of PLWA. Figure 5 shows the distribution of the PLWA against the population living below poverty line. Except for in few locations, the PLWA cases are concentrated in the locations with higher densities of people living below the urban poverty line.

The social-environmental conditions of the areas that most of the PLWA resided were dirty, insecure, risky and congested, but affordable. Low stigma, presence of AIDS support groups, medical support from non-governmental organizations, and affordable living standards in these areas of the city made living more comfortable, and, attracted more that came to the city to seek medical attention.

### 5. Conclusion

The paper presents an endeavour in utilizing GIS with available population census data to explore the spatial distribution characteristic of the people living with HIV/AIDS. Presenting the population density and socio-economic profile of Nairobi city at the ward level helped in depicting the urban structure of the city, showing its heterogeneity that has an influence in the spatial distribution of PLWA. Mapping the residence of PLWA at the location level reveal that more people with HIV/AIDS reside in the high density area, which are also characterized by high concentrations of people living below the urban poverty line. The presence of PLWA in some of the medium and low density wards indicate that the AIDS epidemic in the Nairobi is not confined to the poor and deprived areas only.

### References

- Government of Kenya, National AIDS Control Council, (2005). *Kenya HIV/AIDS Data Booklet*. Nairobi
- National AIDS and STI Control Program, Ministry of Health Kenya (2005). *AIDS in Kenya, Trends, Interventions and Impact, 7<sup>th</sup> ed*. Nairobi
- Zulu, E.M., Dodoo, F. N.-A., Ezech, A. C., (2004) *Urbanization, Poverty, and Sex: Roots of Risky Sexual Behaviors in Slum Settlements in Nairobi, Kenya*. In Kalipeni E., Craddock S., Oppong J. R., and Ghosh J.,(2004) (eds) *HIV and AIDS in Africa: Beyond Epidemiology*. Blackwell Publishing

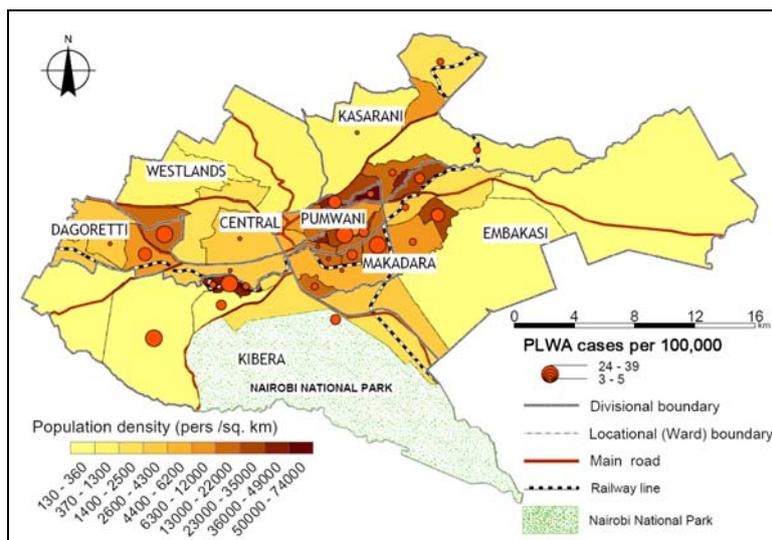


Figure 3: Spatial distribution of PLWA interviewed (per 100,000) and population density

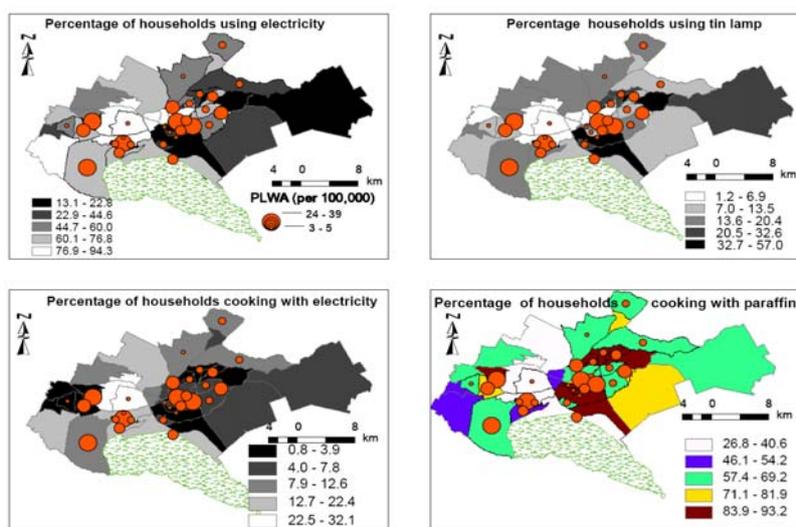


Figure 4: Spatial distribution of the PLWA against main source of household lighting and cooking energy (Lighting: electricity and tin lamp; Cooking: electricity and paraffin)

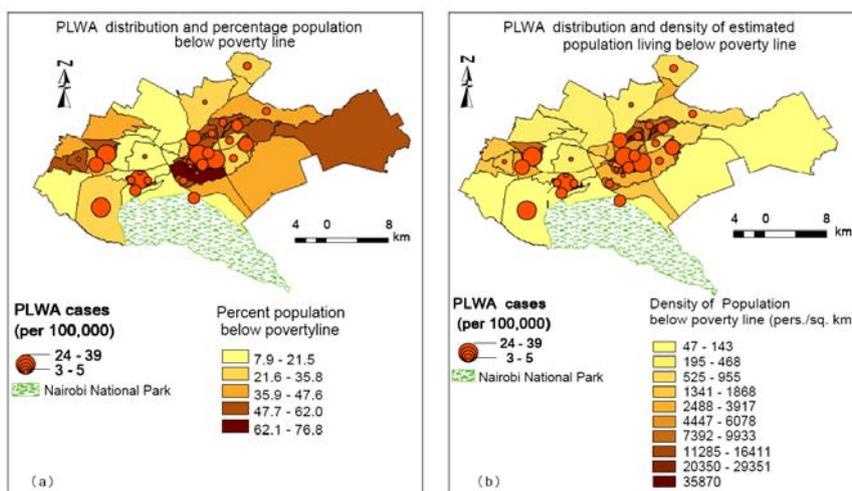


Figure 5: PLWA distribution against (a) percent population below urban poverty line (b) density of population below urban poverty line