

Population,
Development
and
Environment in
Accra: a
collaborative
two-phase study



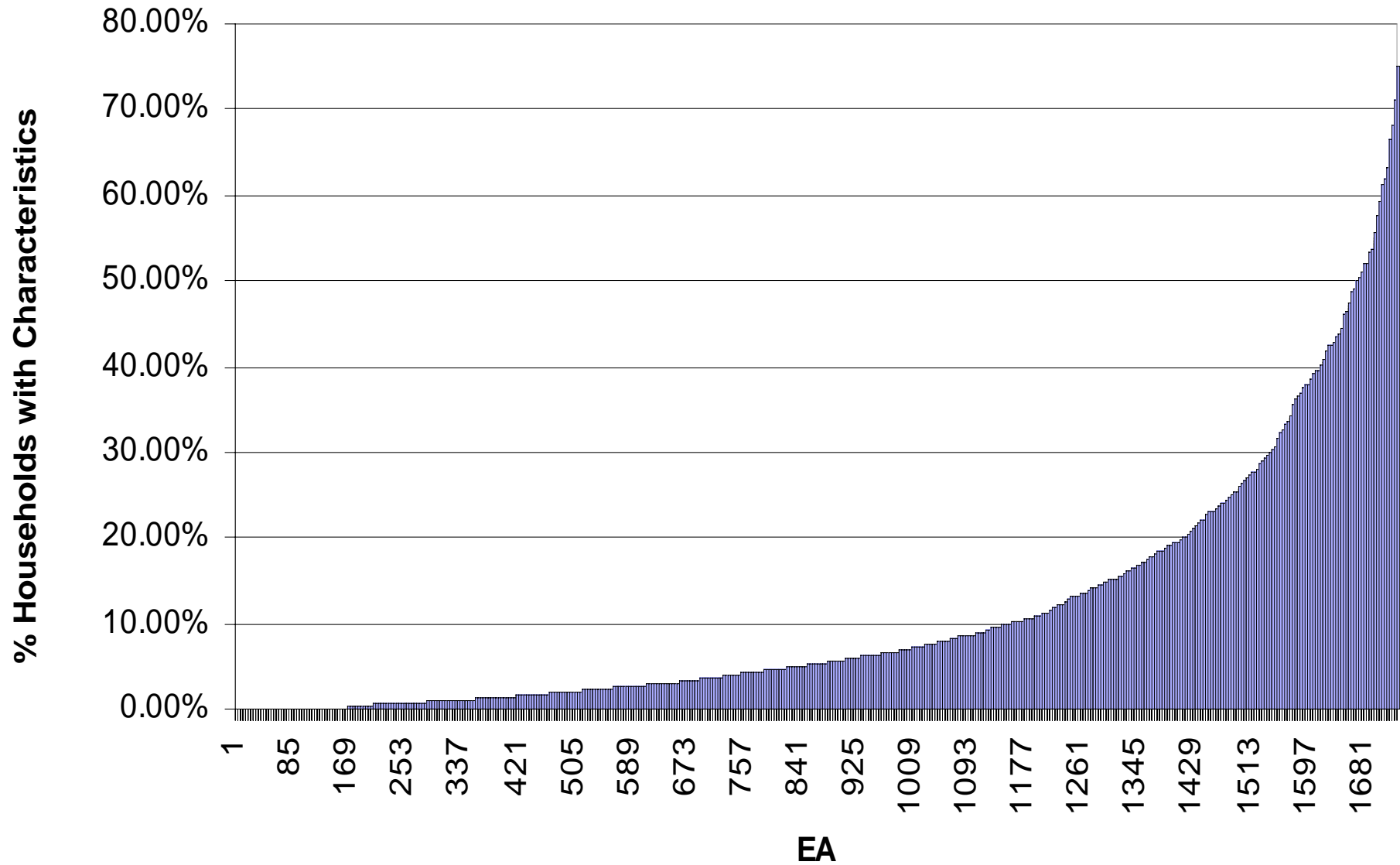
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Aims

- To show how health in cities is strongly affected by the local neighbourhood
- To distinguish the effects of the socio-economic status of households from the effects of environmental factors on mortality and health
- To decompose the environmental factors into a) physical and biological effects and b) effects associated with the socio-economic characteristics of the population of the neighbourhood
- To generalize the methods for application beyond Accra
- To suggest the best strategy for the improvement of the health in cities in Africa



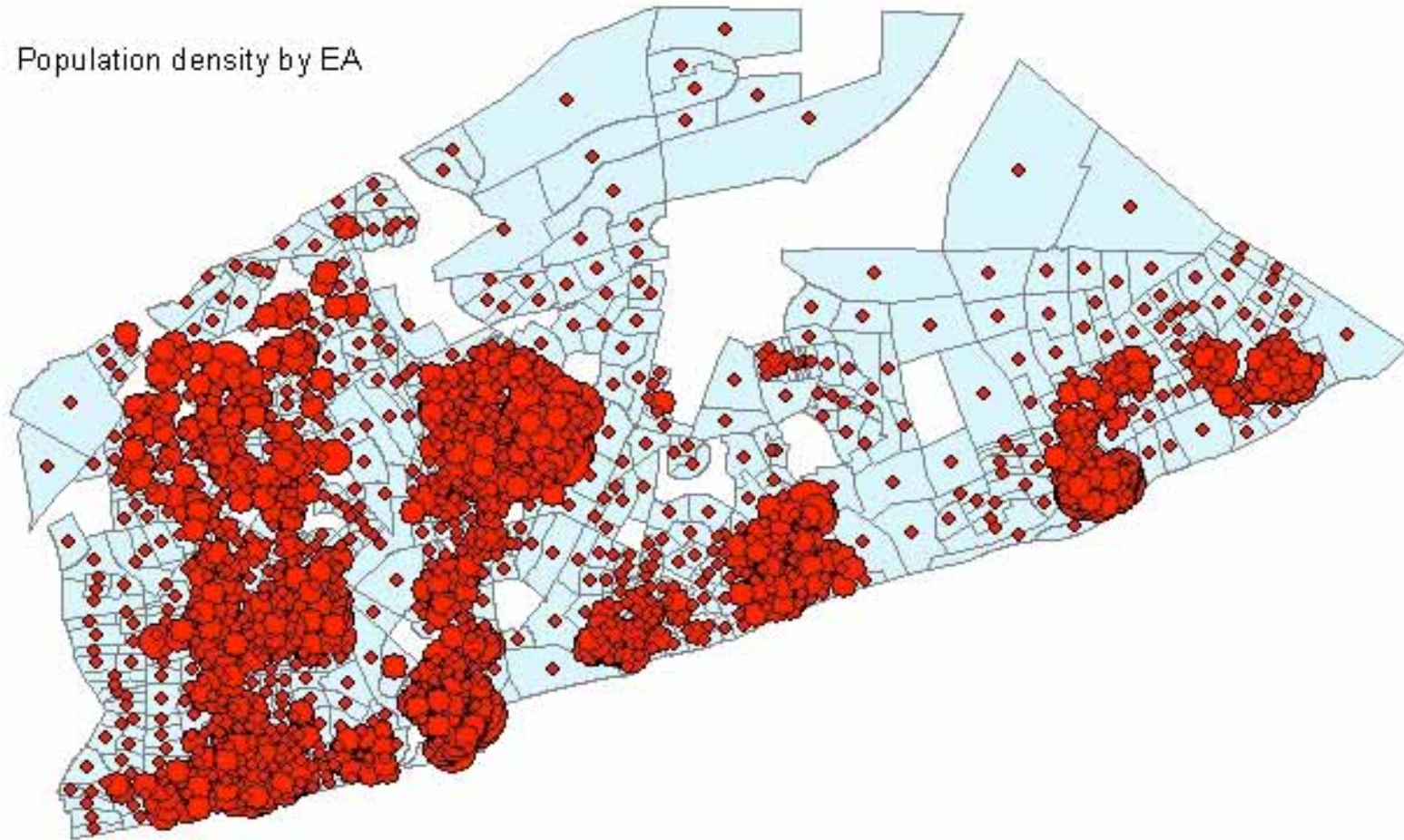
Socio-economic Indicator - AMA



Main sources of information

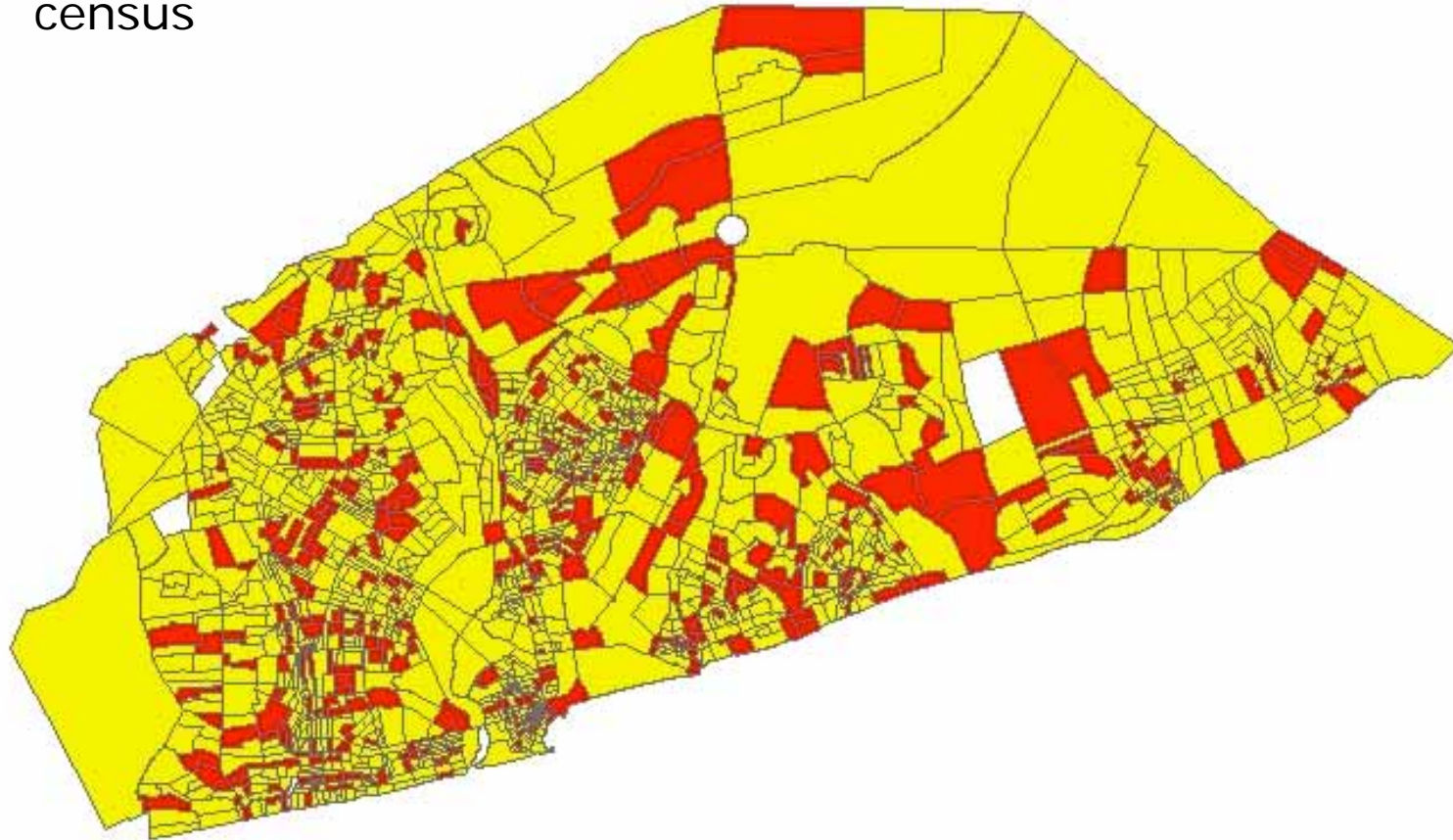
- 10% sample of HHs from 2000 census with EA shape files
- Women's Health Survey of Accra 2003
- Quickbird Digital Globe multi-spectral satellite image

Population density by EA



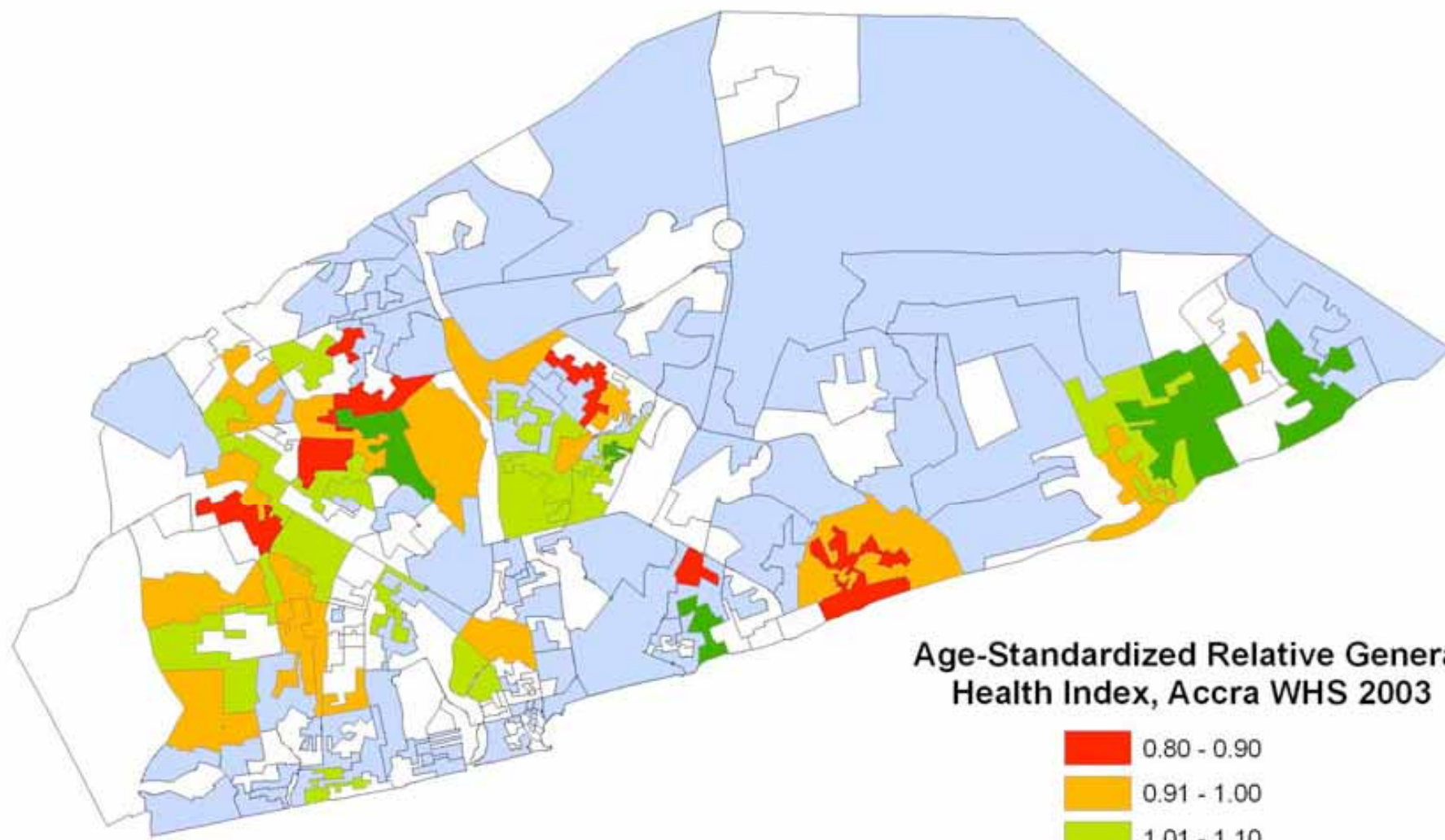


Under 5 mortality in
Accra from the 2000
census



Additional Studies

- Cause of death from the Registry of Births and Deaths 1999-2001 – 38,000 medically-certified deaths. Census 2000 denominators
- 2003 DHS survey
- 2003 World Health Survey
- Census of health facilities and providers
- Urban agriculture and malaria – Klinkenberg & Donnelly
- Household cooking arrangements and risk factors for respiratory illnesses – Majid Ezzati



Age-Standardized Relative General Health Index, Accra WHS 2003

- 0.80 - 0.90
- 0.91 - 1.00
- 1.01 - 1.10
- 1.11 - 1.20
- Not in WHS
- In WHS but <25





Mean Self-Reported Health (5 is worst; 1 is best) by Locality



Moran's I= .40; Z(I)=2.14 at 1500m

Poverty Score based on PCA



Moran's I= .42; Z(I)=4.63 at 3000m

Poverty and health: a weak association

Variable	Standardized Beta Coefficient	t-score
Poverty Score	.361	-2.42

Dependent variable is self-reported health score

R = .361

Adjusted R2 = .108

No outliers; little evidence of heteroscedasticity; Moran's I for residuals = .33; Z(I) = 1.69 at 1500m

Poverty and vegetation: % vegetative cover and normalized difference vegetation index

Variable	Standardized Beta Coefficient	t-score
Pct Vegetation	-.793	-7.92
Dependent variable is poverty score for locality		
Adjusted R2 = .62		
No outliers; evidence of heteroscedasticity; Moran's I for residuals=.43, Z(I)=2.26 at 1500m		

Variable	Standardized Beta Coefficient	t-score
NDVI	-.798	-8.04
Dependent variable is poverty score for locality		
Adjusted R2 = .63		
No outliers; little evidence of heteroscedasticity; Moran's I for residuals = .21, Z(I)=1.83 at 2000m		

Health and vegetation: % vegetative cover and normalized difference vegetation index

Variable	Standardized Beta Coefficient	t-score
Pct Vegetation	-.283	-1.77
Dependent variable is self-reported health score aggregated at the locality level		
Adjusted R2 = .05		
Two outliers; some evidence of hetero-scedasticity; Moran's I for residuals = .44; Z(I)= 2.24 at 1500m.		

Variable	Standardized Beta Coefficient	t-score
NDVI	-.295	-1.85
Dependent variable is self-reported health score aggregated at the locality level		
Adjusted R2 = .06		
One outlier; some evidence of heteroscedasticity; Moran's I for residuals = .38; Z(I)= 1.92 at 1500m.		

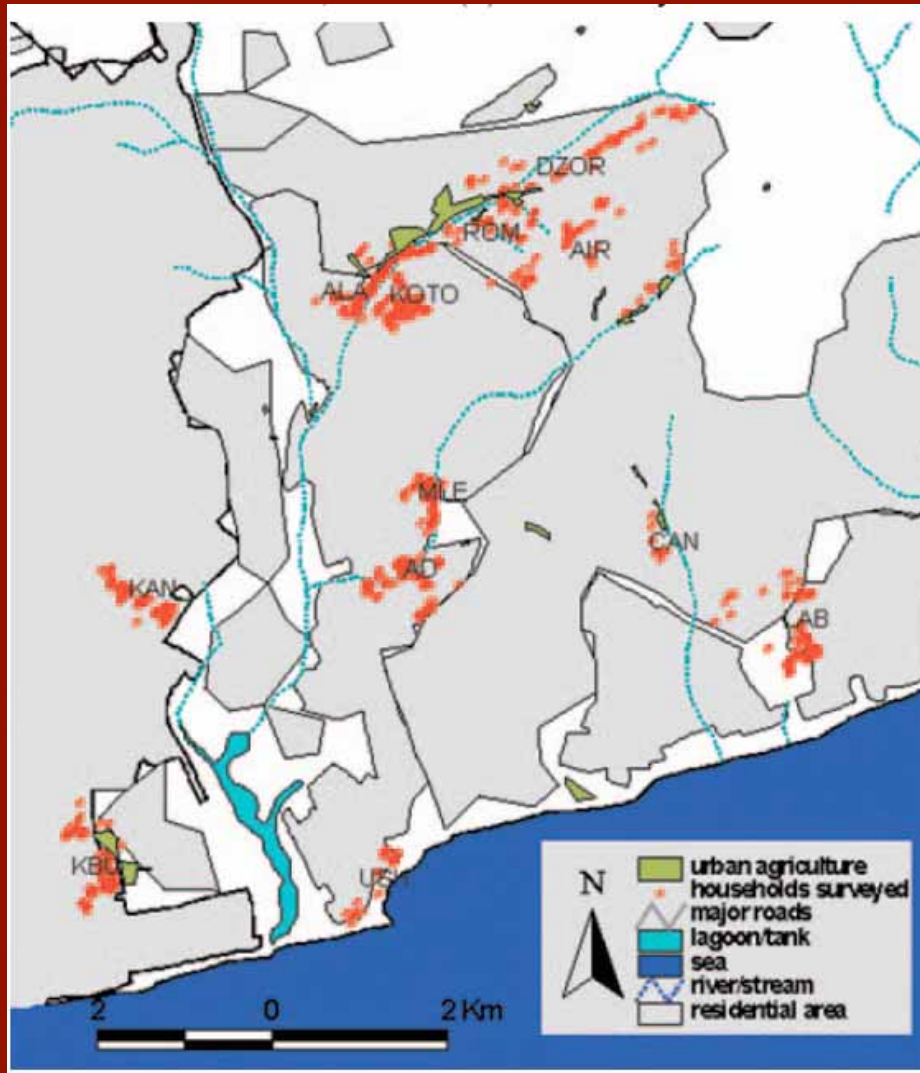


Figure 1. Location of urban agricultural (UA) sites and households surveyed within Accra, Ghana. Communities surveyed are shown with full name, UA or control (C), number of children sampled, and malaria prevalence. AIR, (Airport, UA, n = 77, 19.5%); ALA, (Alajo UA, n = 166, 15.1%); DZOR, (Dzorwulu UA, n = 132, 19.7%); KBU, (Korle Bu, UA, n = 181, 8.8%); KOTO, (Kotobabi, UA, n = 219, 18.3%); ROM, (Roman Ridge, UA, n = 105, 22.9%); CANT, (Cantonments, UA, n = 23, 13.0%); MLE, (Kokomlemle, C*, n = 160, 20.6%); AD, (Asylum Down, C*, n = 160, 11.3%); KAN, (Kaneshie, C, n = 159, 19.5%); LAB, (Labonia/LA, C, n = 175, 9.7%); USH, (Ushertown, C, n = 200, 6.5%). Communities marked C* were originally identified as control communities but small UA sites were later identified close to them.



Source: Klinkenberg et al. 2005

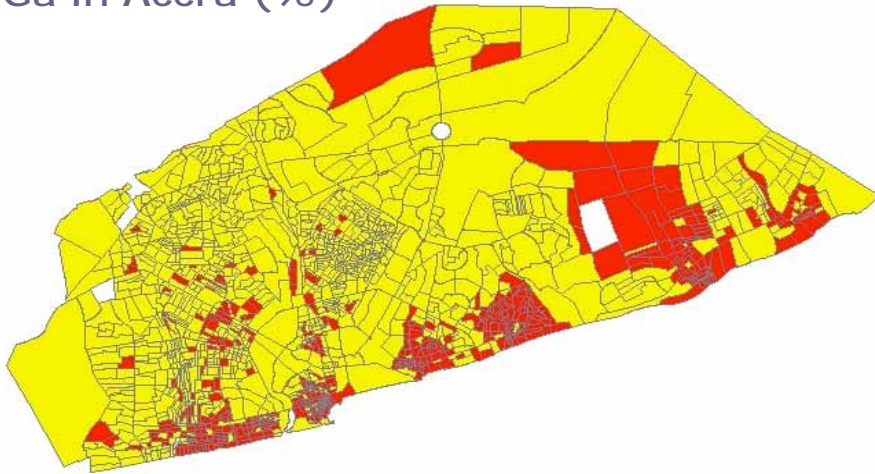
Percent diagnosed with malaria



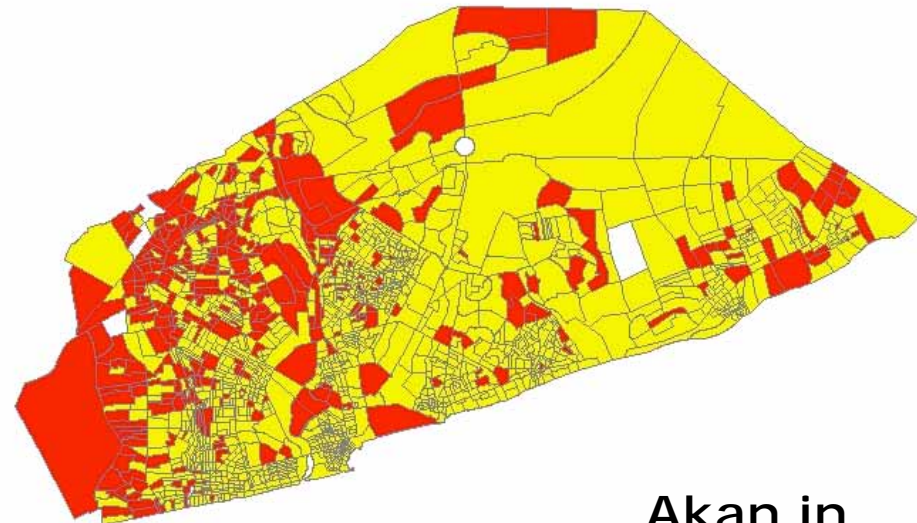
Moran's $I = .14$; $Z(I) = 1.99$ at 3000m

The sorting process at work

Ga in Accra (%)

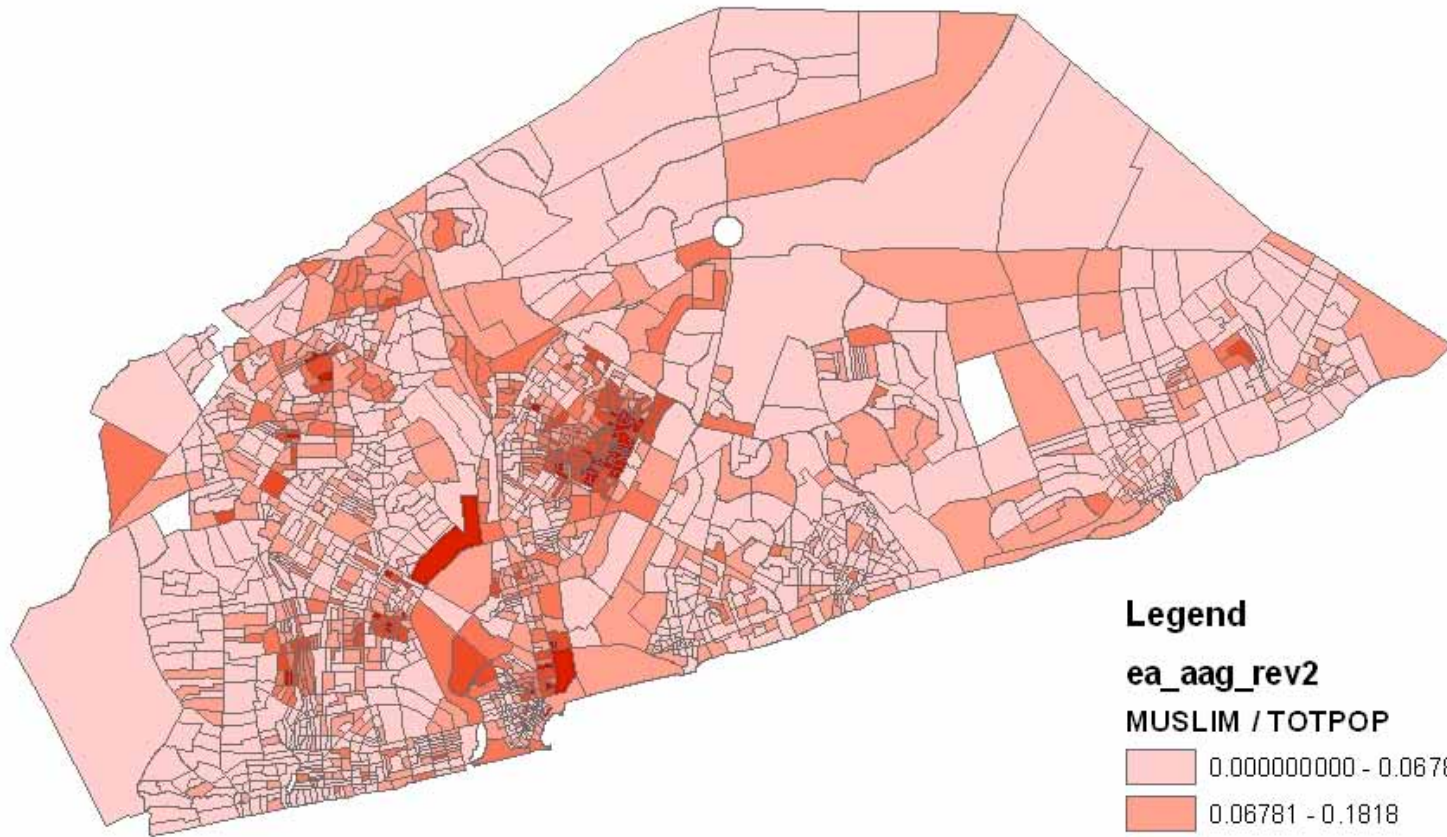


Source: 2000 census



Akan in
Accra

Muslims In Accra



Legend

ea_aag_rev2

MUSLIM / TOTPOP

0.000000000 - 0.06780

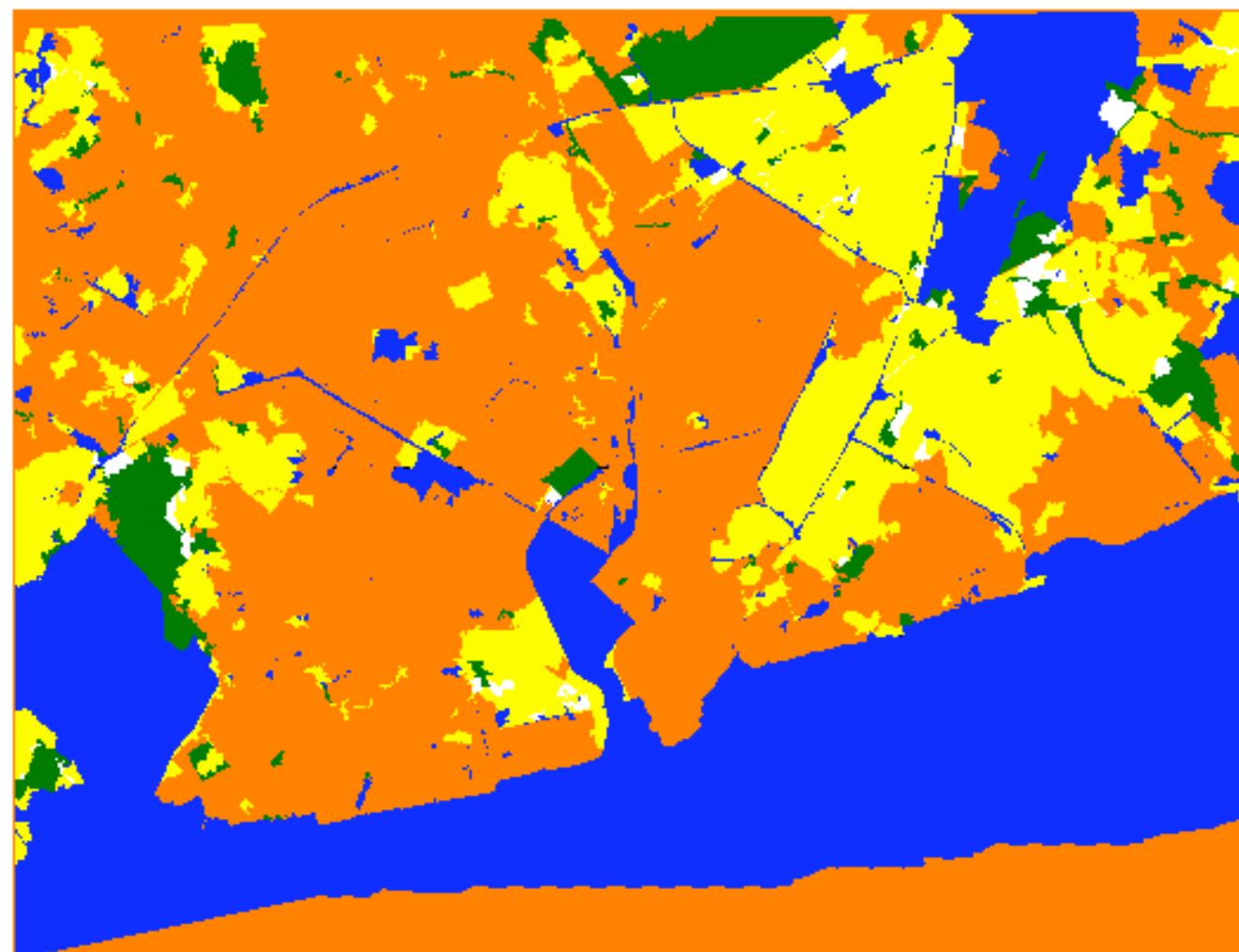
0.06781 - 0.1818

0.1819 - 0.3448

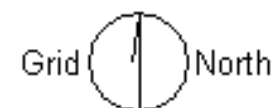
0.3449 - 0.5607

0.5608 - 1.000

Accra Residential Distribution - Preliminary



- Commercial/Water
- Forest/Crops
- Residential - High SE
- Residential - Low SE
- Unclassified



Opinion of respondents in Nima/Maamobi on how to cope with environmental risks & health problems

General opinion	Locality	
	Nima	Maamobi
Provision of rubbish containers/regular collection of refuse	52.2	19.7
Adherence to public regulations	54.4	43.1
Provision of public toilets	12.2	15.3
Prohibition of free-range animal husbandry	1.4	5.8
Encouragement of communal labour	2.0	4.4
Reconstruction of houses with toilet/bathing facilities	3.4	10.2
Stop charging people for disposal of waste into containers	1.4	1.5
N	147	157

Roles of communities in Nima/Maamobi coping with environmental & health risks

General opinion	Locality	
	Nima	Maamobi
Encouragement communal labour	71.4	46.2
Adherence to Public Regulations/Laws	14.3	21.0
Promotion of Personal Hygiene	5.4	6.7
Involvement of Opinion Leaders	0.7	8.4
Public Education on Sanitation	6.1	15.1
Provision of Toilet Facilities in Houses	2.0	2.5
N	147	119

Roles of government in coping with environmental & health risks

	Locality		
	Communities	Nima	Maamobi
Law enforcement	43.0	16.0	
Provision of refuse containers	13.4	11.1	
Provision of more public toilets	9.9	18.1	
Training of more Sanitary Officers	8.5	4.2	
Intensive Public Educations	12.7	8.3	
Government / Community Partnership	1.4	3.5	
Provision of logistics to support communal labour	5.6	24.3	
Mass spraying of mosquitoes	1.4	7.6	
Provision of affordable houses	2.8	5.6	
Demolishing of unapproved structures	1.4	1.4	
	N	142	144

Conclusions

- Very marked differentials in health and mortality in Accra with a clear spatial expression.
- Very clear differentials in income with a similarly strong spatial pattern. At this ecological level of analysis, poverty was not very highly predictive of health.
- We did find a strong effect of ethnicity which serves as a measure for the strong effect of other sorting processes.
- We also found that using data from the satellite imagery showed that a lack of vegetation is associated with poverty but since poverty levels at the locality level are only weakly associated with health, the lack of vegetation is similarly not very predictive of poor health.

Policy recommendations

- New interventions must deal with the processes by which people are sorted to particular neighbourhoods as well as the levels of service provision in these neighbourhoods. There are barriers to land ownership that inhibit local initiatives and allocate sub-groups to particular parts of the city, many of them the least salubrious.
- The work in Nima-Maamobi reveals a strong awareness of the importance of environmental effects on health and welfare but often the mechanisms linking environmental concerns and health were poorly understood.
- The main barrier to improvement of the local environment was the inability of local communities, many recent immigrants and so not part of the older urban power structures, to influence government spending to invest in expensive environmental improvements, most notably potable water and main sewage.
- Making environmental and health concerns the centre of the political arena is the next challenge.