## Theoretical framework

Mortality by age and sex is often used as baseline data for demographic analyses. However, these variables are insufficient if we aim to understand spatial and temporal variations of mortality in urban areas and between areas of residence. These areas are characterized by a very high degree of geographical diversity and the analysis of health inequalities cannot ignore this diversity. While analysis of deaths by age and gender makes it possible identification of populations at risk, the spatial location of at-risk populations, as well as analysis of spatial pattern of different urban areas could improve our knowledge on health problems and provide appropriate responses to combat them. In African urban areas, the analysis of health problems is hampered by availability of complete and reliable data. Several studies on mortality inequalities are limited to childhood mortality due to the lack of general mortality data. General mortality data could be provided by civil registration, or census database. The objective of this study is to analyze the spatial and temporal variations of mortality in Dakar. Deaths reported in the civil registration database in Dakar were analyzed using a health geography approach.

## Data and methods

In civil registration database, we aggregated total number of deaths into five age – groups, which are : 0 – 1 year ; 1 – 5 years ; 5 – 15 years ; 15 – 60 years ; 60 years and +. We reported them to respective population sizes and obtained age – specific mortality rates. These data were spatially joined with neighborhood boundaries for spatial analysis.

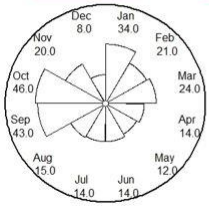
The determinants of mortality refer to habitat quality, which is measured here in two ways: household's socio-economic conditions and neighborhoods environmental conditions. Variables related to socioeconomic conditions are households building materials type, level of comfort, access to sanitation and safe water source. Land cover and land use data provide environmental variables such as agricultural area, natural vegetation areas, planned habitat, deprived habitat and bare soil. Based on principal component analysis and hierarchical clustering, we created an index of habitat quality and classified the neighborhoods. We identified five neighborhood profiles. The first index relates to good living conditions, the second describes environmental conditions and the third refers to poor building materials. In spatial regression model, dependent variable is age – specific mortality and we used habitat quality index as explanatory variables.

## Results

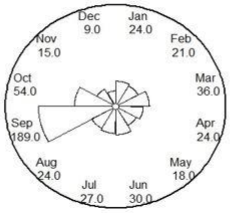
*Seasonality of deaths:* First we analyzed seasonality of deaths and found that, except old age mortality, high prevalence of mortality always occurs in September – October. As the rainy season begins in July, ecological factors are suspected to provide a favourable ground for the

transmission of infectious diseases. Chronic diseases are not subject to environmental factors and mainly affect the elderly.

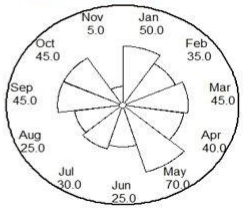
Childhood (0 – 1 year)



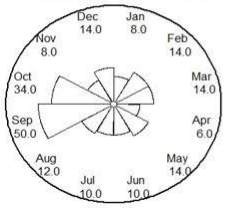

Infants and teenagers (5 – 15 years)



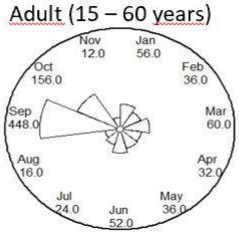

Old age (60 years and +)



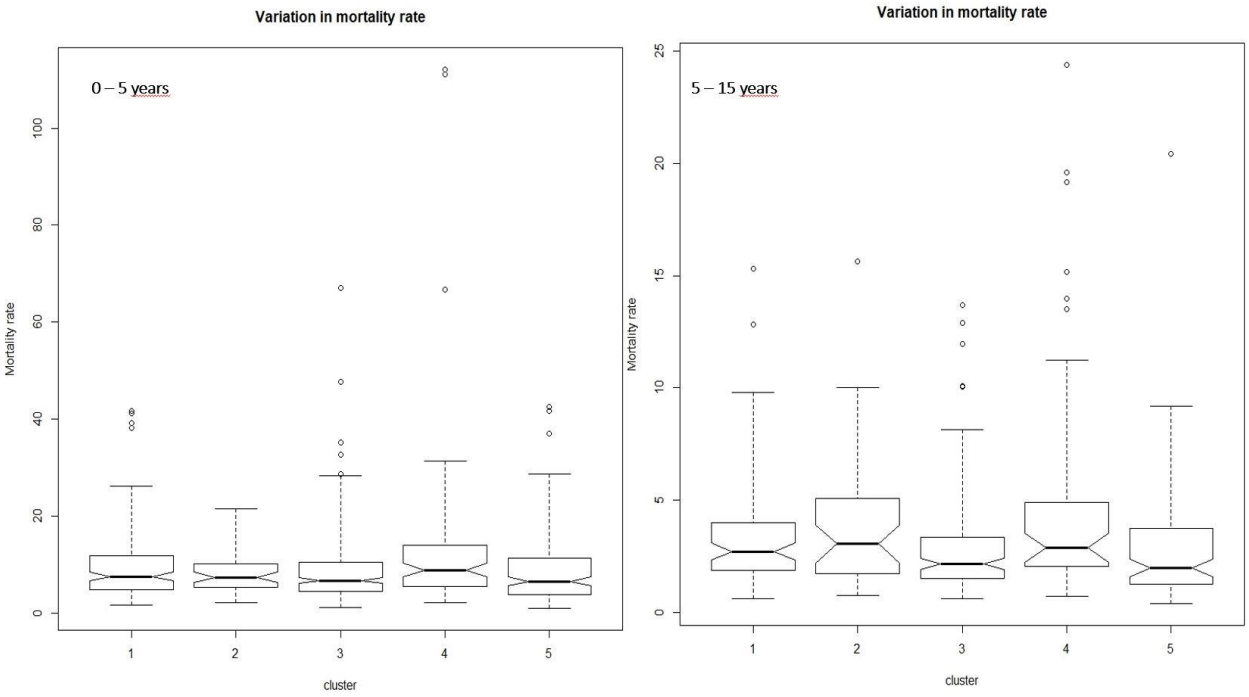

Juvenile (1 – 5 years)



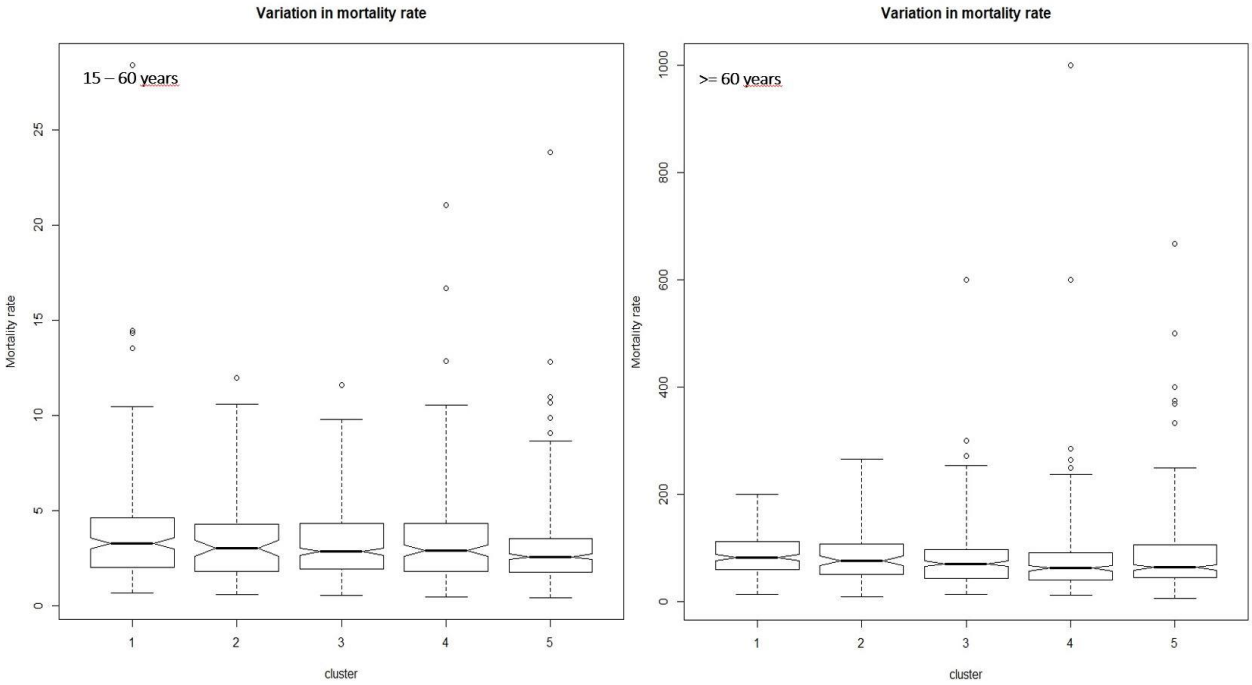

Adult (15 – 60 years)




*Impacts of living conditions on deaths:* In hierarchical clustering, we identified five neighborhood profiles in Dakar : 1: Spontaneous settlements – 2: Spontaneous settlements with low density population – 3: Planned habitat – 4: Administrative, commercial and services areas – 5: Residential neighborhoods. The graphs below show the incidence of mortality by these profiles.




Overall, highest mortality rates are reported in spontaneous neighbourhoods (cluster 1 and 2), while residential neighbourhoods (cluster 5) have the lowest crude death rates. Statistical tests including Kruskal – Wallis test were performed to test for differences between profiles. As the p.value is less than the significance level (< 0,05) there are significant difference between groups. But paired tests show that there are no significant differences between some groups.




With Moran's index, we will test presence of spatial autocorrelation in order to reduce spatial dependency in the regression model.