THE USE OF GIS FOR MAPPING HIV//AIDS SUSCEPTIBLE AREAS IN ADDIS ABABA,, ETHIOPIA

AHMED SEID
AHRI
Ethiopia
APRIL, 2008
Background

- Addis Ababa is the capital city of Addis Ababa and is also the political, economic, and the cultural, center of the country.
- Addis Ababa has an estimated total population of 3.2 million. Over 51% of the population is female.
- There are 24 hospitals in Addis Ababa (five of which are owned by the Addis Ababa Health Bureau). 24 health centers and 46 health posts. In addition, there are 487 clinics categorized into lower, medium, higher and special types; these include privately owned clinics and those owned by non-governmental organizations.
- In Addis HIV/AIDS is the most challenging problem in terms of social, economical, political, and cultural aspects. Even nowadays it is a common thing to lose someone so close due to this disease.
The groups most vulnerable to infection were identified as commercial sex workers and young people, particularly unemployed educated young adults.

A preliminary assessment conducted by Zelalem on 105 poor women (including housewives, maids, students, unemployed youth and commercial sex workers) found that 69 were found to be carriers of the virus. Some respondents felt that women in low economic classes are victims as they are exposed to many sex partners to fulfill their need for food, clothing, and other necessities.

In order to alleviate this major problem different strategic plans have been proposed and carried out by different governmental and non-governmental bodies; Of course, most of the strategies are good but if it was for GIS techniques manipulated to develop these strategies; then it would have been better.

In order to ease this acute spread of the disease, an integrated and well-planned method of prevention planning, evaluation, and surveillance of the HIV/AIDS spread is necessary.
• GIS and remote sensing is one of the recent tools in identifying, classifying and mapping areas vulnerable to the problem.

**Geographic Information System**

• Geographic Information System (GIS) is an organized collection of computer Hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.

• GIS is a set of tools increasingly being used in the Public Health arena for analyzing, planning, decision making, problem solving, and research.
Objectives

**General Objectives**

- To apply GIS techniques to HIV/AIDS prevention planning, evaluation, and surveillance in the Addis Ababa city.
- To recommend the best strategy to resource allocation for prevention of the spread of HIV/AIDS, and to give care and support to those parts of the society who have fallen victim to the disease.

**Specific objectives.**

- To assess the spatial distribution of high HIV/AIDS susceptible areas of the Addis Ababa city.
- To maximize the number and quality of VCT centers in the city and to identify top priority areas of the city and establish such health facility centers.
- To identify those areas of the city that show high HIV/AIDS prevalence and to investigate the factor/s associated with this high incidence and to establish a strategic plan to combat the problem.
- To monitor the entire progress of the prevention and care/support activities.
Methods

- Projected population data of the year 2006 and the 1994 Census for each Woreda of the Addis Ababa city (Source: Central Statistics Authority 2005). From which the following demographic characteristics were derived:

<table>
<thead>
<tr>
<th>TABULAR DATA</th>
<th>Attaching the Tabular data to the shape file Attribute of each Woreda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young Population Data</td>
<td>AA Woredas Shape Data</td>
</tr>
<tr>
<td>Female Population Data</td>
<td></td>
</tr>
<tr>
<td>Sex Workers Population Data</td>
<td></td>
</tr>
<tr>
<td>Establishments with Sex Workers</td>
<td></td>
</tr>
<tr>
<td>Low Income Population Data</td>
<td></td>
</tr>
</tbody>
</table>
SHAPE DATA (VECTOR)

- Young Population Shape data
- Female Population Shape Data
- Sex Workers Population Shape Data
- Establishments with Sex Workers
- Low Income Population Shape Data

Interpolation (Contour Creation)
- Clipping

THEMES

RASTER DATA

- Young Population Raster data
- Female Population Raster Data
- Sex Workers Population Raster Data
- Establishments with Sex Workers Data
- Low Income Population Raster Data

Deriving Commensurate Criteria Maps
Linear Scale Transformation

STANDARDIZED RASTER DATA

- Female Population Raster Data
- Sex Workers Population Raster Data
- Establishments with Sex Workers Data
- Low Income Population Raster Data
- Young Population data

Assigning Criterion Weighting Pair wise Comparison Method

- Young Population Raster data (Wt1)
- Sex Workers Population Raster Data (Wt2)
- Establishments with Sex Workers Data (Wt3)
- Female Population Raster Data (Wt4)
- Low Income Population Raster Data (Wt5)
HIV/AIDS Susceptibility Map
GIS-BASED DATA PROCESSING AND ANALYSIS TECHNIQUES

Processing the ‘Young Population’ GIS Layer:

Young Population Density = Tot. Young Pop. in each Woreda Area of each Woreda

Female Population Density = Tot. Female Pop. in each Woreda Area of each Woreda
Sex Workers Population Density = Tot. Sex Workers Pop. in each Woreda Area of each Woreda

Establishments Density = Tot. Establishments in each Woreda Area of each Woreda

Female Sex Workers Density

Establishments Density Incorporating Female Sex Workers
In order to create the HIV/AIDS susceptibility map of the Addis Ababa city, the existing spatial distribution of the HIV/AIDS epidemic must be mapped, and then compared to the suggested spreading factors. The degree of correlation between each factor map and the existing HIV/AIDS spatial distribution map is calculated, so that it will be helpful when giving weights to each of the criterion map.
4.1.7. Mapping the VCT Centers Distribution

In order to see the spatial distribution of the Health Centers that work in the areas of HIV/AIDS prevention and control activities, it is important to have a separate map that shows the spatial distribution of such facilities (for example the spatial distribution of VCT center).

**Criterion Weighing**

The resulting weighted sum vectors are:

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YP</strong></td>
<td><strong>FP</strong></td>
<td><strong>SW</strong></td>
<td><strong>ES</strong></td>
<td><strong>EI</strong></td>
</tr>
<tr>
<td>1.113</td>
<td>0.521</td>
<td>2.245</td>
<td>1.447</td>
<td>0.182</td>
</tr>
</tbody>
</table>
The GIS map-overlay facility

Output Layer

Reclassification and Ranking
DISCUSSIONS

• The HIV/AIDS susceptibility map of Addis Ababa, which is developed by integrating the GIS techniques and Multicriteria Decision Support System, has four major HIV/AIDS susceptibility zones. These susceptibility zones are ranked in relative terms as: the ‘Highest’, the ‘Higher’ the ‘High’, and the ‘Low’ susceptible zones to HIV/AIDS risk.
• The Susceptibility map that the majority of Addis Ababa is found in the ‘Low’ susceptible zone. Generally, the central northwest part of the city is found under the ‘Highest’ and ‘Higher’ HIV/AIDS susceptible zones, whereas the eastern and southern parts of the town are found in the ‘Low Susceptible’ zone.