

 **2nd International Cancer Control Congress**  
November 25 to 28, 2007


**THE USE OF SPATIAL ANALYSIS AS A TOOL TO SUPPORT PREVENTION PROGRAMS: AN EXAMPLE FROM THE MUNICIPALITY OF RIO DE JANEIRO**

Juliana Moreira de Oliveira Ferreira; Luis Iván Ortiz Valencia; Marceli de Oliveira Santos; Julio Fernando Pinto Oliveira; Rejane de Souza Reis; Cláudio Pompeiano Noronha



Instituto Nacional de Câncer – INCA – Coordenação de Prevenção e Vigilância – Divisão de Informação.


Contact: Divisão de Informação – CONPREV/INCA/MS – Rio de Janeiro, Brasil.  
e-mail: [conprev@inca.gov.br](mailto:conprev@inca.gov.br)



 **BACKGROUND**


- Epidemiological cancer research - search for environmentally-associated determinants;
- Significant change in objectives, the emphasis now being on prevention rather than cure;
- Spatial analysis techniques have proven to be important instruments for evaluating the impact of social-structural processes in determining health events;
- Geographical Information Systems (GIS) and spatial statistical analysis methods constitute new tools for analysis in epidemiology, permitting visualization of the spatial distribution of a disease and testing for the occurrence of spatial agglomerates, hence creating hypotheses on its origin.



 **OBJECTIVE**

- To analyze and to describe spatial patterns of cervical cancer incidence rates;
- To correlate the spatial relationship between cervical cancer incidence rates and their social determinants: incidence rates and some socioeconomic and demographic indicators;
- To modeling incidence rates using a spatial statistical model with socioeconomic and demographic indicators as independent variables;
- To correlate incidence rates and socioeconomic and demographic indicators in a Geographical Information System - GIS.

 **METHOD**

- **Incidence data:** PBCR of Rio de Janeiro, 1995 - 1998;
- **Socioeconomic and demographic measures:** Life expectancy; expected number of scholarly years (chief of household); expected number of children; percent of illiterate adults (ages 25 and above) and per capita income - Census 2000 (IBGE);
- **Population data:** Brazilian Institute of Geography and Statistics Foundation – IBGE;
- **Statistical methods:** exploratory analysis, spatial data analysis, cervical cancer rates mapping, geographic correlation, SAR spatial regression.

## STATISTICAL METHODS

- Incidence rates (specific and age adjusted);
- Exploratory data analysis;
- Spatial data analysis;
- Modeling;
- Geographical Information System – GIS.

## CERVIX UTERI CANCER

**Etiology:**

- Begins with a pre-invasive lesion (“in situ” carcinoma) detectable and treatable. Cytological screening has the potential to prevent the development of invasive cancer;
- Begins to rise at age 20-29 years, and the risk increases rapidly to reach a peak usually around age 45-49 in European populations, but later in developing countries.

**Risk factors:**

- Human papillomavirus – HPV – necessary cause of disease. Co-factors: sexual behavior; increasing number of pregnancies; social deprivation.

**Magnitude:**

- Second most common cancer among women worldwide. Almost 80% of the cases occur in developing countries;
- Brazil – Second cancer more incident in women. Fourth cause of death. Brazilian estimative (2008), showed 19 new cases per 100,000 women;
- From municipality of Rio de Janeiro was observed 25 new cases per 100,000 women.

# Results

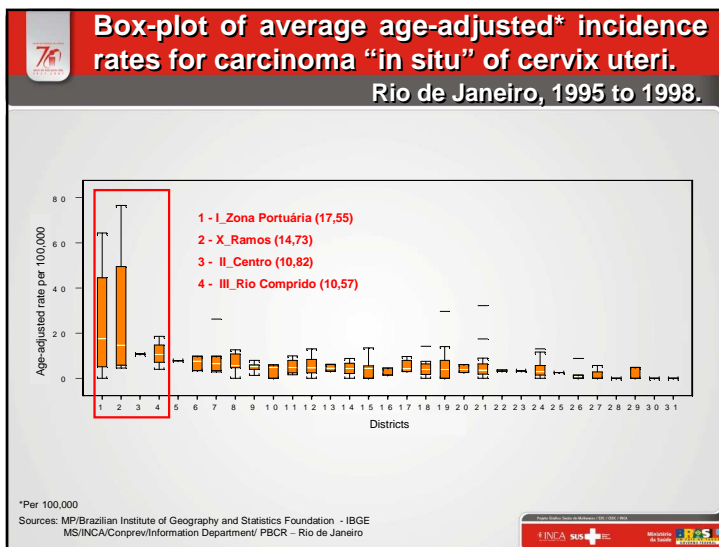
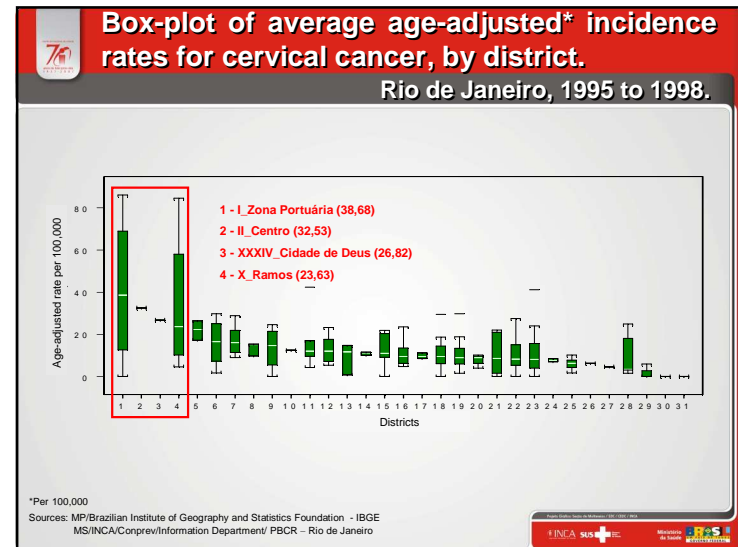
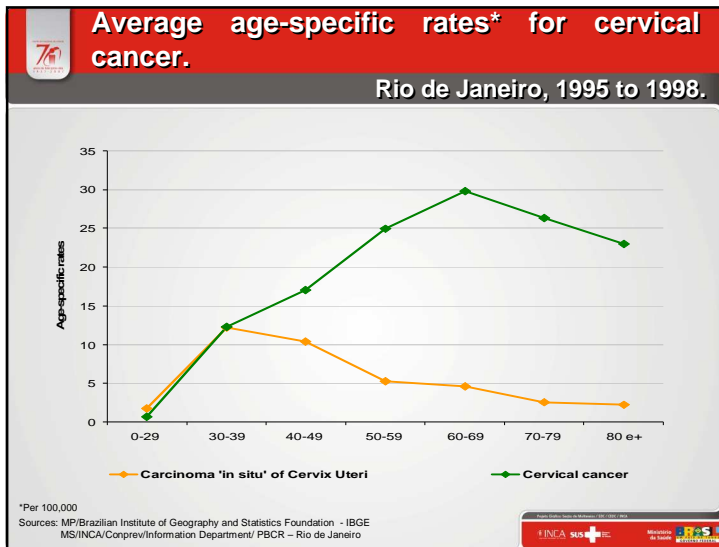
## Women Profile

## Percentage distribution for cervical cancer by behavior.

Rio de Janeiro, 1995 to 1998.

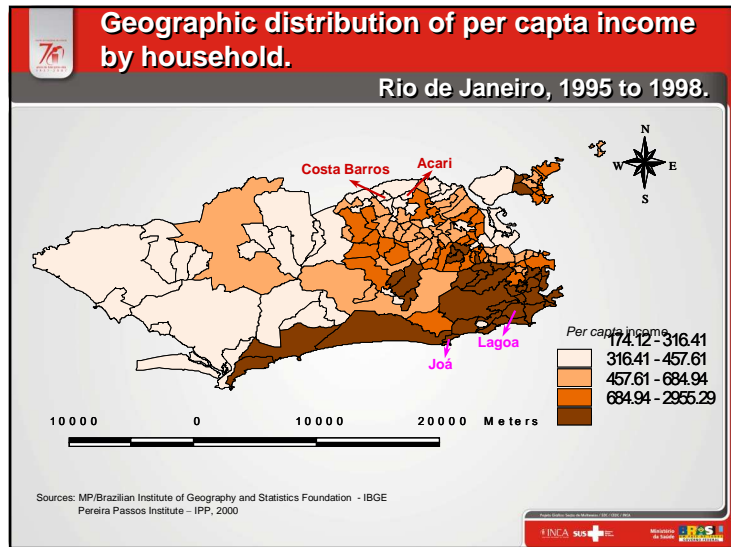
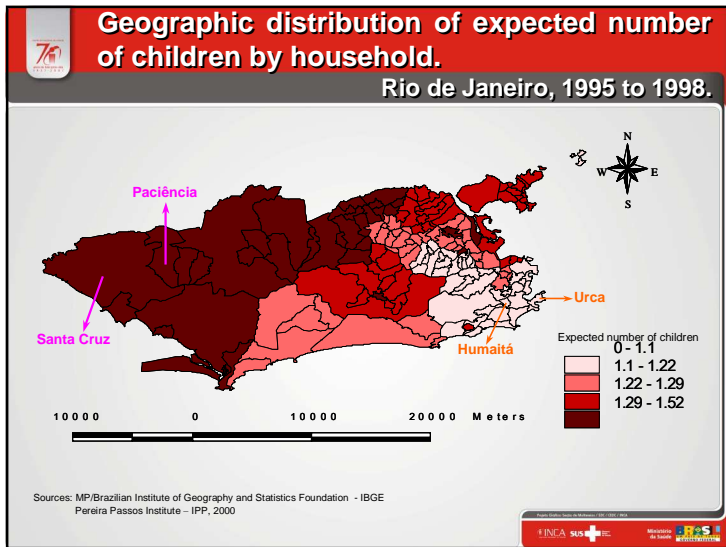
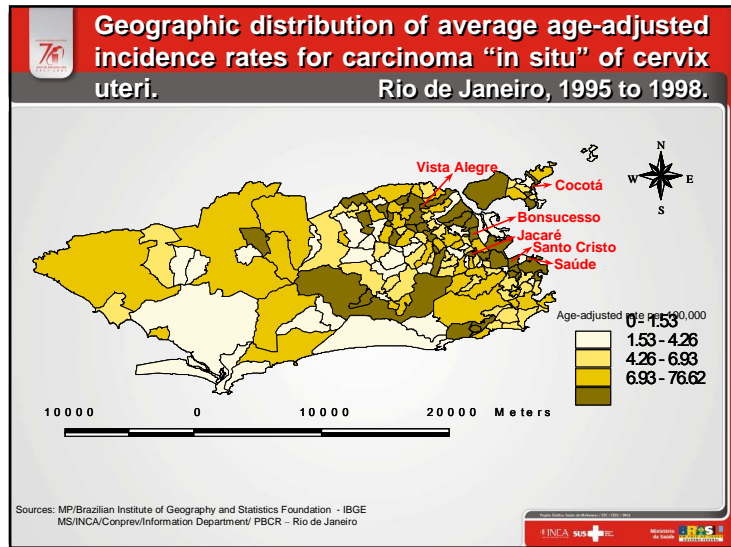
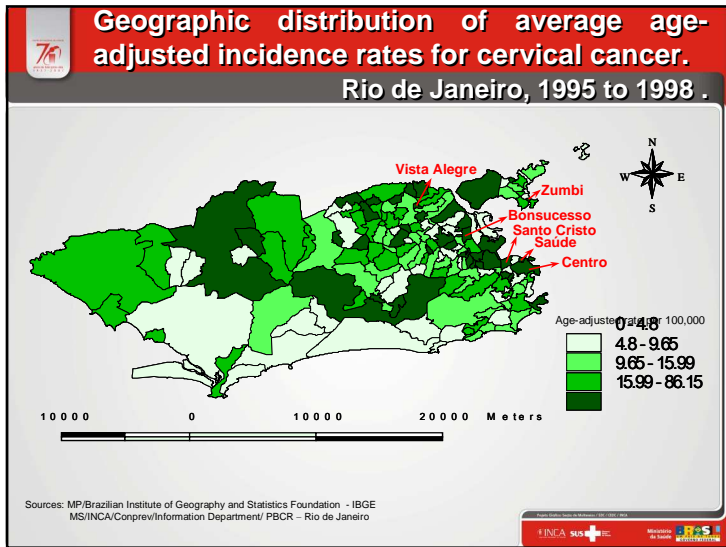
Behavior	Percentage
Cervical cancer	68.3%
Carcinoma "in situ" of Cervix Uteri	31.7%

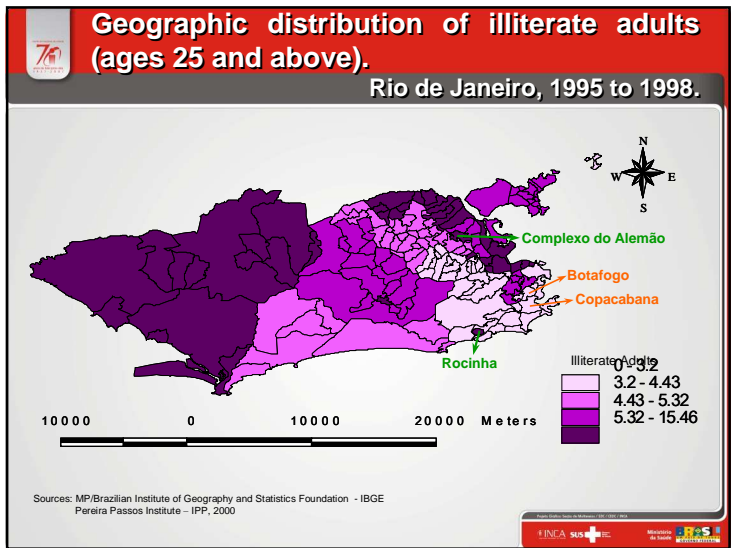
Sources: MP/Brazilian Institute of Geography and Statistics Foundation - IBGE  
MS/INCA/Conprev/Information Department/ PBCR – Rio de Janeiro



# Results

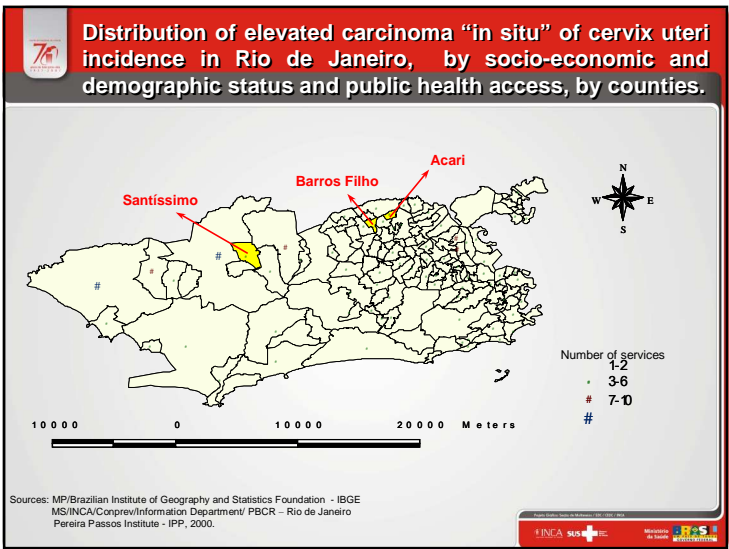
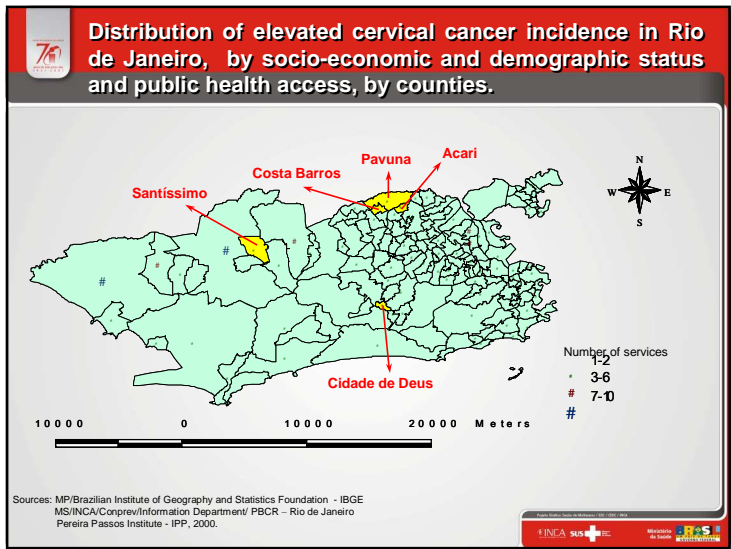
## Spatial Modeling





## Results

### Geographical Information System - GIS





## RESULTS

- There are differences in the incidence of cervical cancer rates according geographical to distribution;
- The highest average adjusted incidence rates were found in places where were found worse social indices and scarce health care services;
- The places with the highest mean incidence rates, poorest social indexes and greatest scarcity of health services were the districts of Acari, Barros Filho and Santíssimo, both with respect to carcinoma in situ and to malignant cervical cancer.



## CONCLUSION

- Surveillance for disease prevention and control purposes can be applied to the problem of disease clusters.
- Information of geographical pattern of cancer incidence can contribute to planning effective and efficient cancer control programmes aiming to reduce cancer morbidity/mortality and improve the quality of life of the Brazilian population.
- People who are responsible for public policies may benefit substantially from these techniques, in monitoring the disease, directing efforts towards primary prevention, early detection and timely treatment in those areas in which high incidence rates are found in conjunction with unfavorable social indicators