# ECOHEALTH
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## Spatio-temporal analysis of infectious diseases and its association with variables related to climatic and housing conditions in Ecuador

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## BACKGROUND

Infectious diseases, are still representing a high burden in Ecuador, in particular:

- Air-borne infections or acute respiratory diseases as neumonia, bronchitis, turberculosis, etc...(IDC-10 J00 to J22, A15-A16)
- Water-borne infections or intestinal / diarrheal diseases (A00-A09)
- Vector-borne infections: dengue, malaria, chagas, etc...(A90 to A95, B50 to B57)

### Temporal Evolution
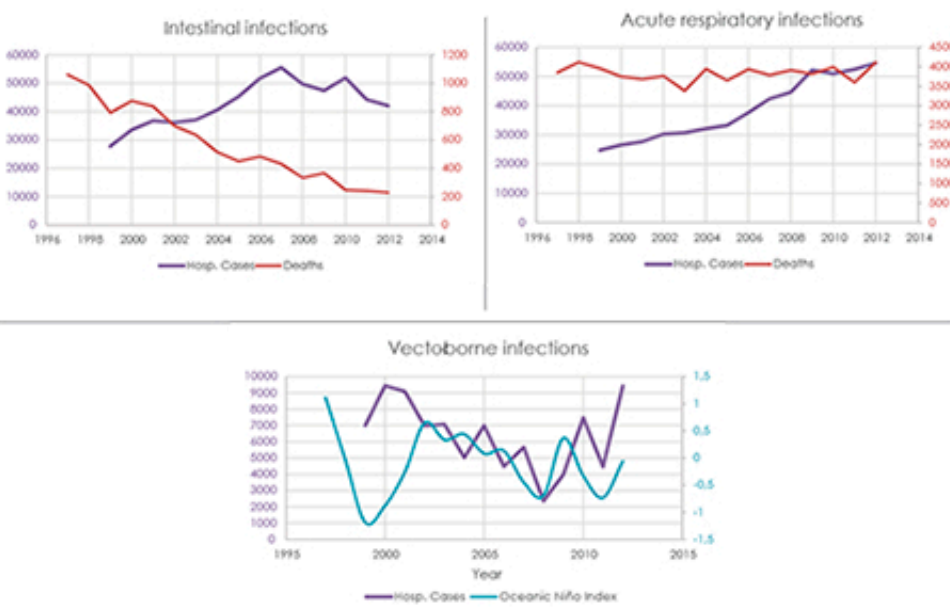


Among health determinants, the ones for which data is available consists in climatic information from satellite images and census data about population and housing.

## MAIN OBJECTIVE

To Structure in a Geographic Information System (GIS) easily available data related to environment, housing and health in Ecuador, in order to explore the spatial relationships between infectious diseases and some possible determinants.

## METHODOLOGY

Previous to any spatial analysis, there is a need to integrate in a same platform the various information available.

### Geodatabase structure

| Category | Variable | Unit | Source | Spatial | Time |
|---|---|---|---|---|---|
| Environmental | Precipitation | mm (/h) | TRMM | 25 x 25 km | Monthly |
| | Temperature | °C | MOD11C3 | 5 x 5 km | Monthly |
| | Vegetation | Index (-1 to 1) | MOD13Q1-MYD13Q1 EVI | 250 x 250 m | 8-days |
| Housing | Roof material | Mode or, for each material: % population or % house | INEC housing census | 40649 sectors | decadal |
| | Wall material | | | | |
| | Floor material | | | | |
| | Crowding | Average persons by bedroom | | | |
| Health | Morbidity | Cases | INEC hospital register | 1024 parishes | yearly |
| | Mortality | Deaths | INEC deaths register | 1024 parishes | yearly |

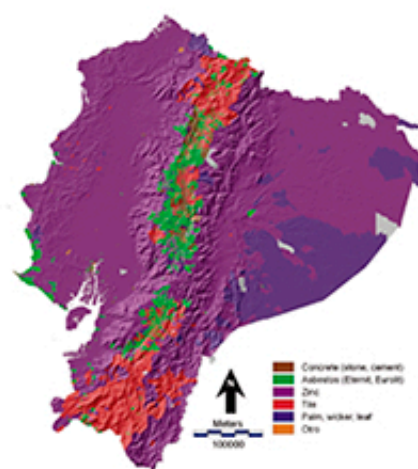Region studied : continental Ecuador.
Year considered : 2010.

## RESULTS

Three types of house had been created for each continental Ecuadorian region: coast, highlands, amazonia. Roof, wall and floor combination was defined using statistics from the 2010 housing census. The selected materials represent the most used by region.
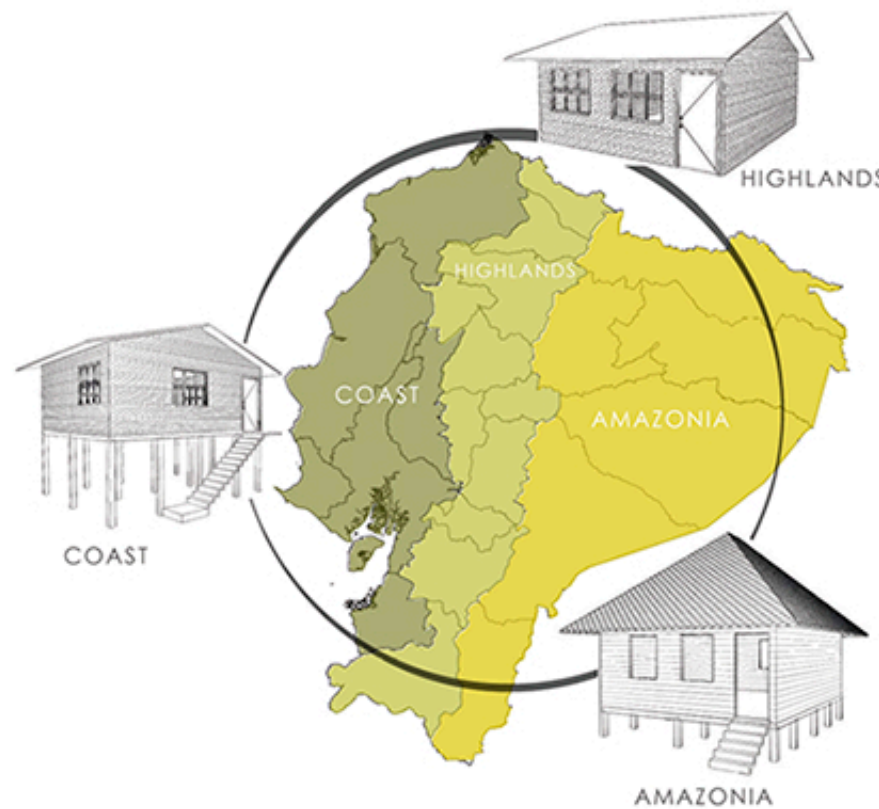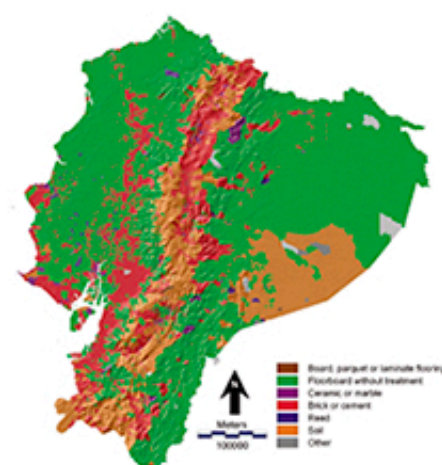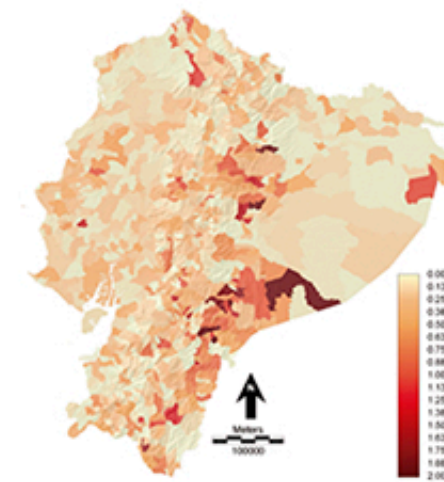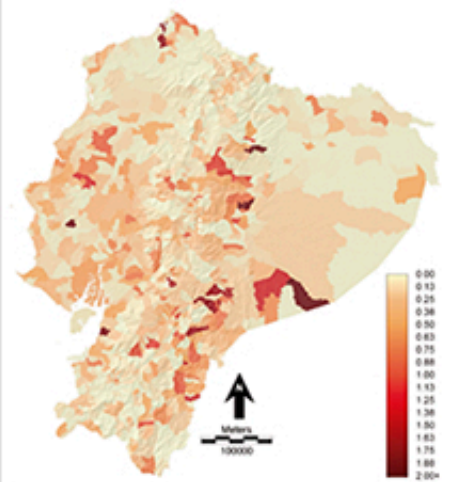


Data Source: INEC

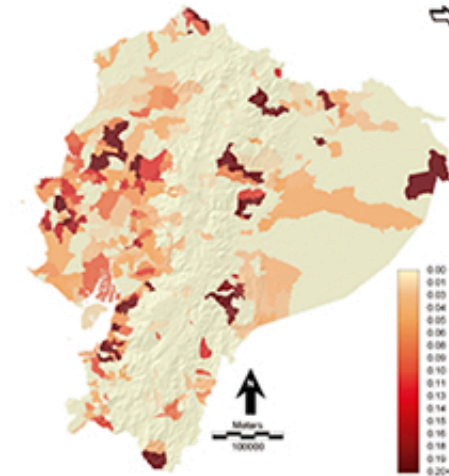### Roof


### Wall


### Floor


Data Source: INEC
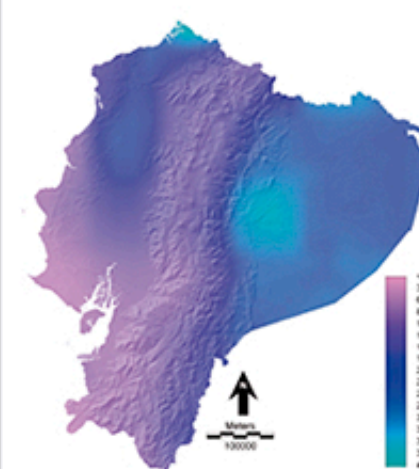
### Respiratory


### Diarrheal
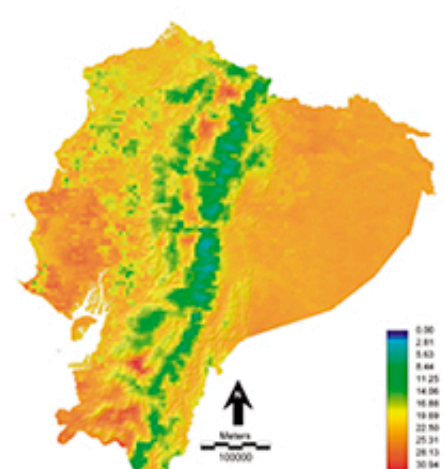

### Vector – borne


Data Source: INEC

As it can be seen in the following maps, the Andean formation with high altitude is a strong determinant for the environmental and housing variables studied.
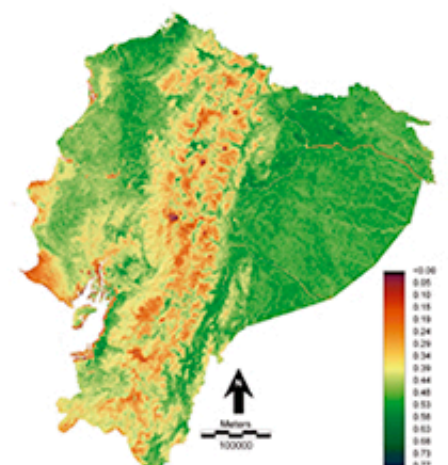
### Annual precipitation


### Temperature


### Vegetation index


Data Source: TRMM, MODIS.

## CONCLUSIONS AND RECOMMENDATIONS

This was an exploratory study that allowed to structure data in order to identify spatial patterns related to environment, housing and health.

The different spatial scales may explain the difficulty to observe a good correlation between variables.

More research is needed to identify temporal evolution and causality relationships.

Among vector-borne diseases, dengue is being studied more deeply in 15 localities of Ecuador at a finest resolution by the entomologic group of the INSPI, and might give useful results for an early warning system.

INEC - Instituto Ecuatoriano de Estadisticas y Censos
TRMM - Tropical Rainfall Measuring Mission
MODIS - Moderate Resolution Imaging Spectroradiometer