

SEASONAL PATTERN OF MORTALITY IN CARDIOVASCULAR DISEASES IN PANAMA

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Introduction

Seasonal patterns of cardiovascular (CV) mortality have been reported in many parts of the world mostly in temperate countries. There is evidence that suggests that some of these seasonal mortality changes are related to extreme ambient temperature. In Panama, a country in the tropics without wide variations in ambient temperature, seasonal patterns of CV mortality had not been studied.

Objective

To determine if in Panama there are seasonal patterns of CV mortality.

Materials and methods

We compiled and analyzed data from the National Population Census of 2000 and 2010, from the National Registry of mortality from CV diseases for the years 2001 to 2009, from the reports of temperature and humidity recorded by the Empresa de Transmisión Eléctrica, S.A. (ETESA) for the years 2001 to 2009 and from the influenza reports for the years 2001 to 2009 of the Department of Epidemiology of the Ministry of Health.

A monthly mortality time series for the period 2001 to 2009 was calculated and its components were decomposed into a twelve-month period utilizing a moving averages technique. Elements, like cycle, seasonal occurrence, and stochastic components were separated. A seasonal index of mortality for CV diseases, cerebrovascular disease (CVD), ischemic heart disease (IHD) and diabetes was also calculated. Only deaths of individuals 65 years and older were used for the analysis.

Cycle analysis was performed independently for each disease. A procyclical relationship was first verified using the Engle-Granger cointegration test in twelve-month periods. The relationship of total deaths from CV diseases, CVD, IHD and diabetes to the number of total influenza cases (ICD-10 J10.0 – J11.8) was then analyzed, using influenza cases as the explanatory variable. In a second analysis, thermal sensation values were defined as the explanatory variable.

Results

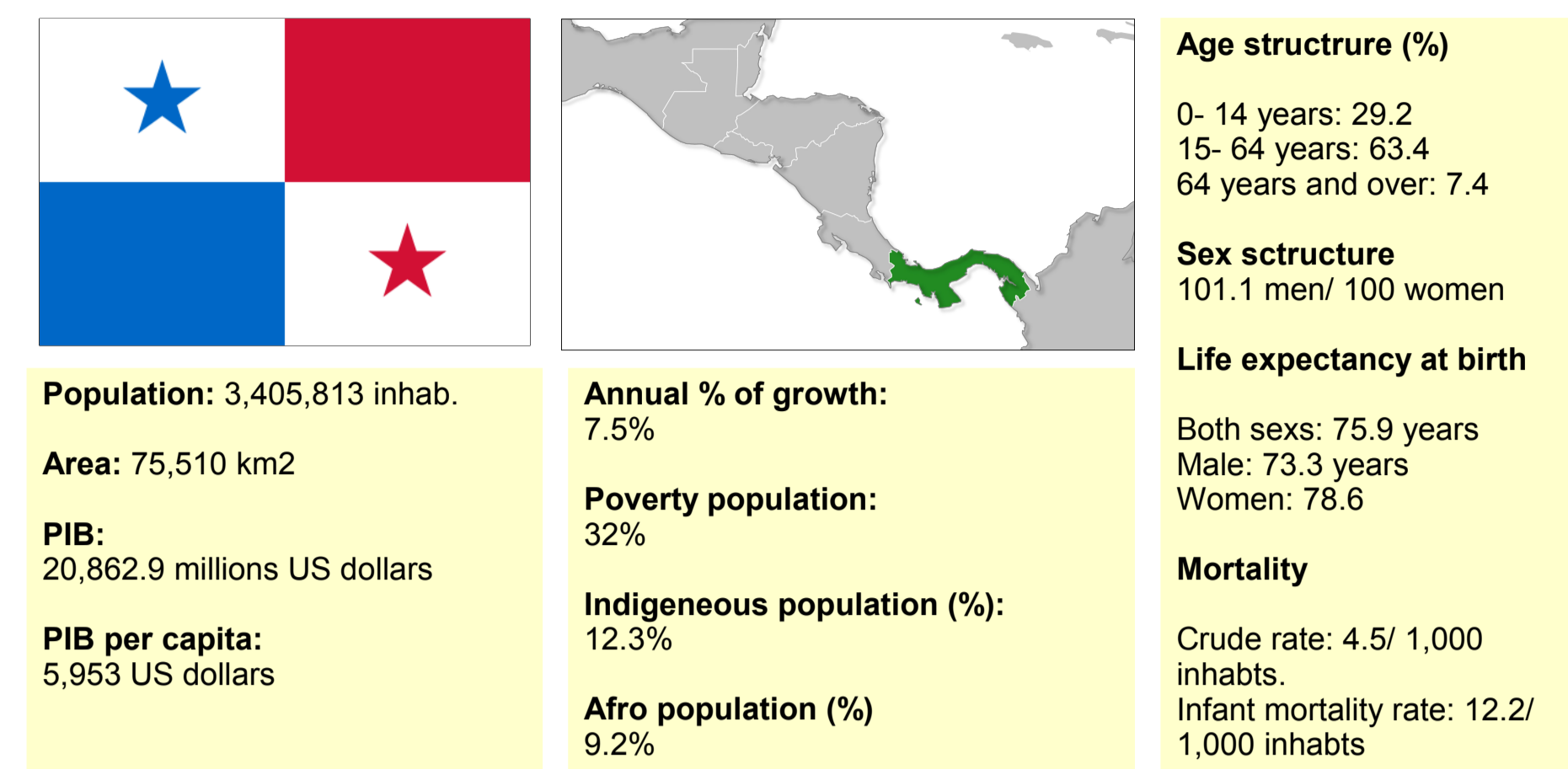
The series analyzed revealed a seasonal patterns for all CV diseases, especially for IHD. Mortality for IHD was lowest during the first trimester and peaked at the beginning of the third trimester of the year. For the month of July, the IHD mortality seasonal index showed its highest score, and the lowest score was in February. Influenza cases had a very similar seasonal pattern.

The time series analysis revealed that each one of the series presented a first order AR(1) pattern. With the cointegration test, each one of the mortality series was first order cointegrable, showed dependency and an approximate temporal gap of one month when influenza cases and thermal sensation were used as independent variables.

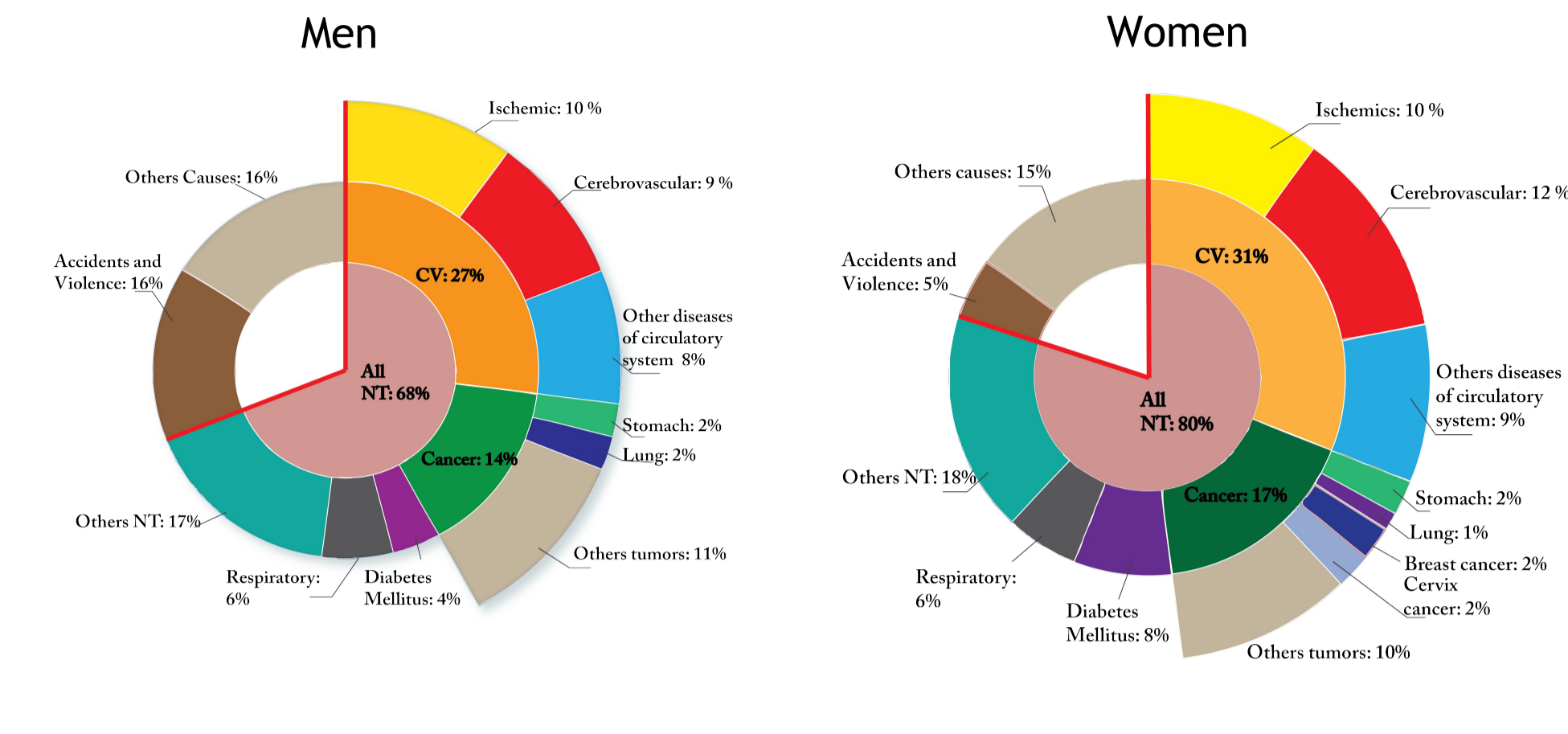
Conclusions

For the period 2001-2009, a seasonal pattern of CV mortality was present in Panama. This pattern is most clearly seen in IHD mortality. The causes of these cyclical changes of mortality have not yet been clearly identified. However, acute respiratory illness and weather may be some of the forces driving the observed cyclical mortality changes.

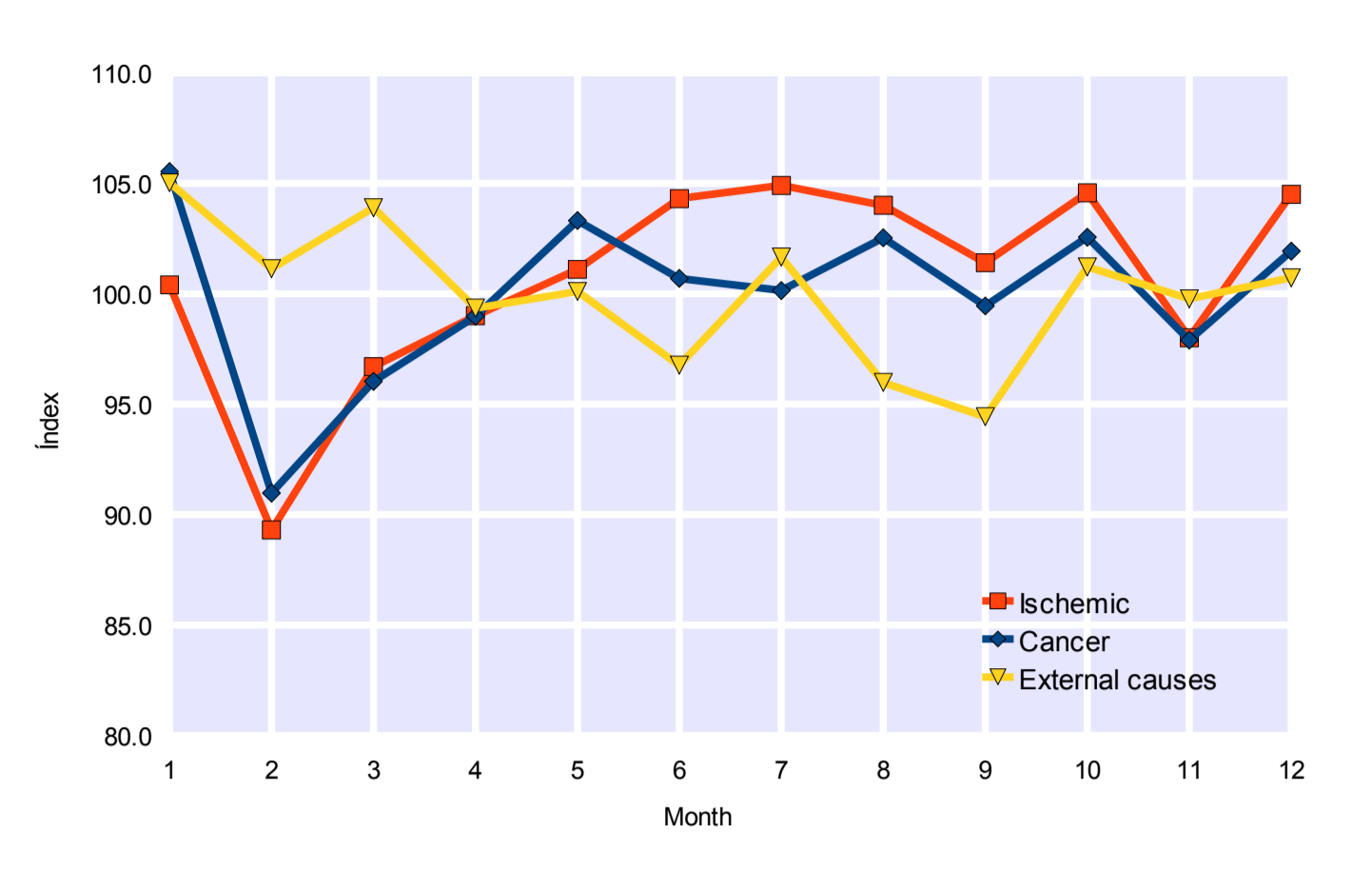
Economic, Social and Health Indicators of Republic of Panama. 2010.



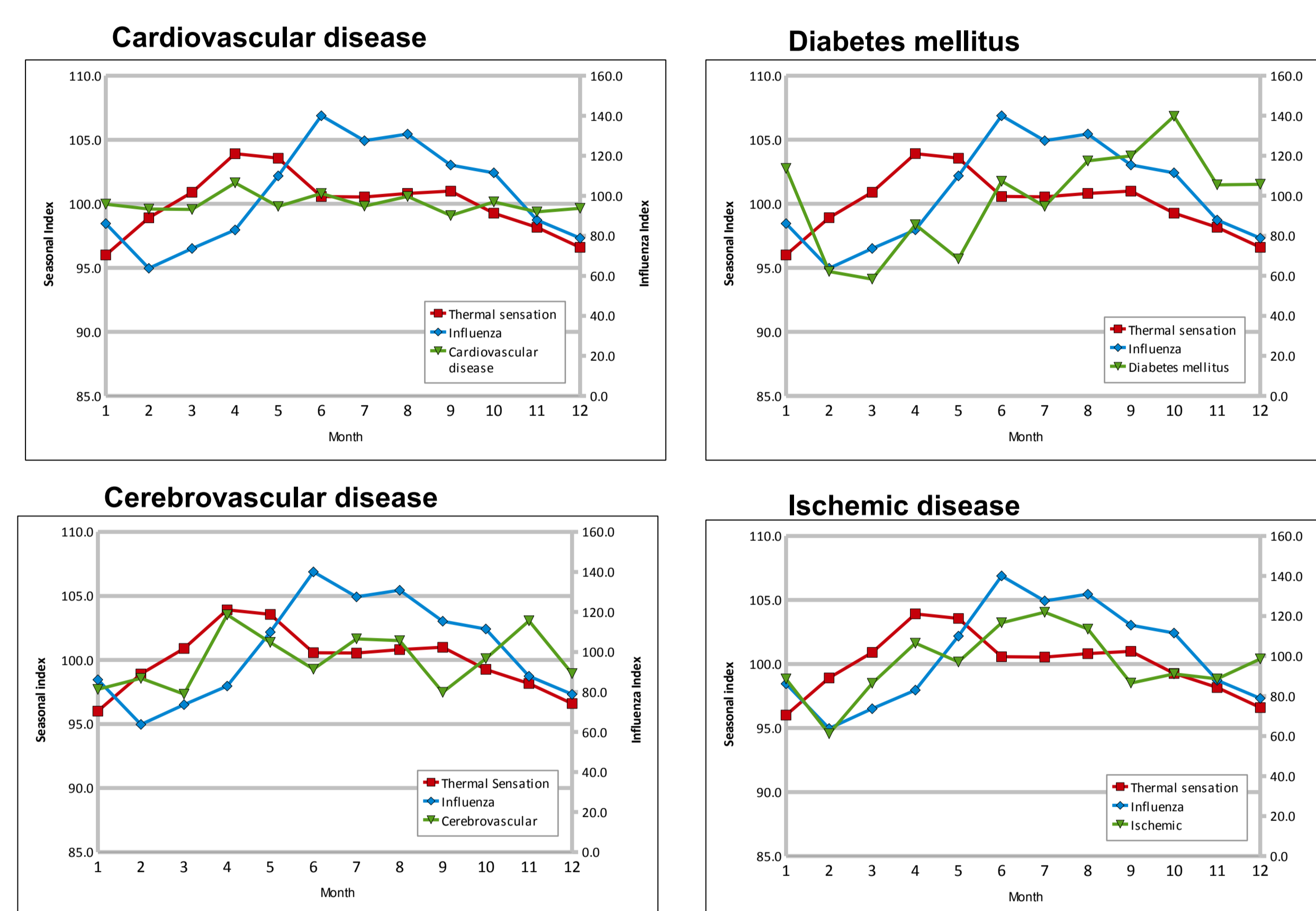
Estimated proportional mortality by major causes of death in Panama according to gender, 2001-2009.



Seasonal index of mortality by ischemic disease, cancer and external causes in Panama. 2001 - 2009



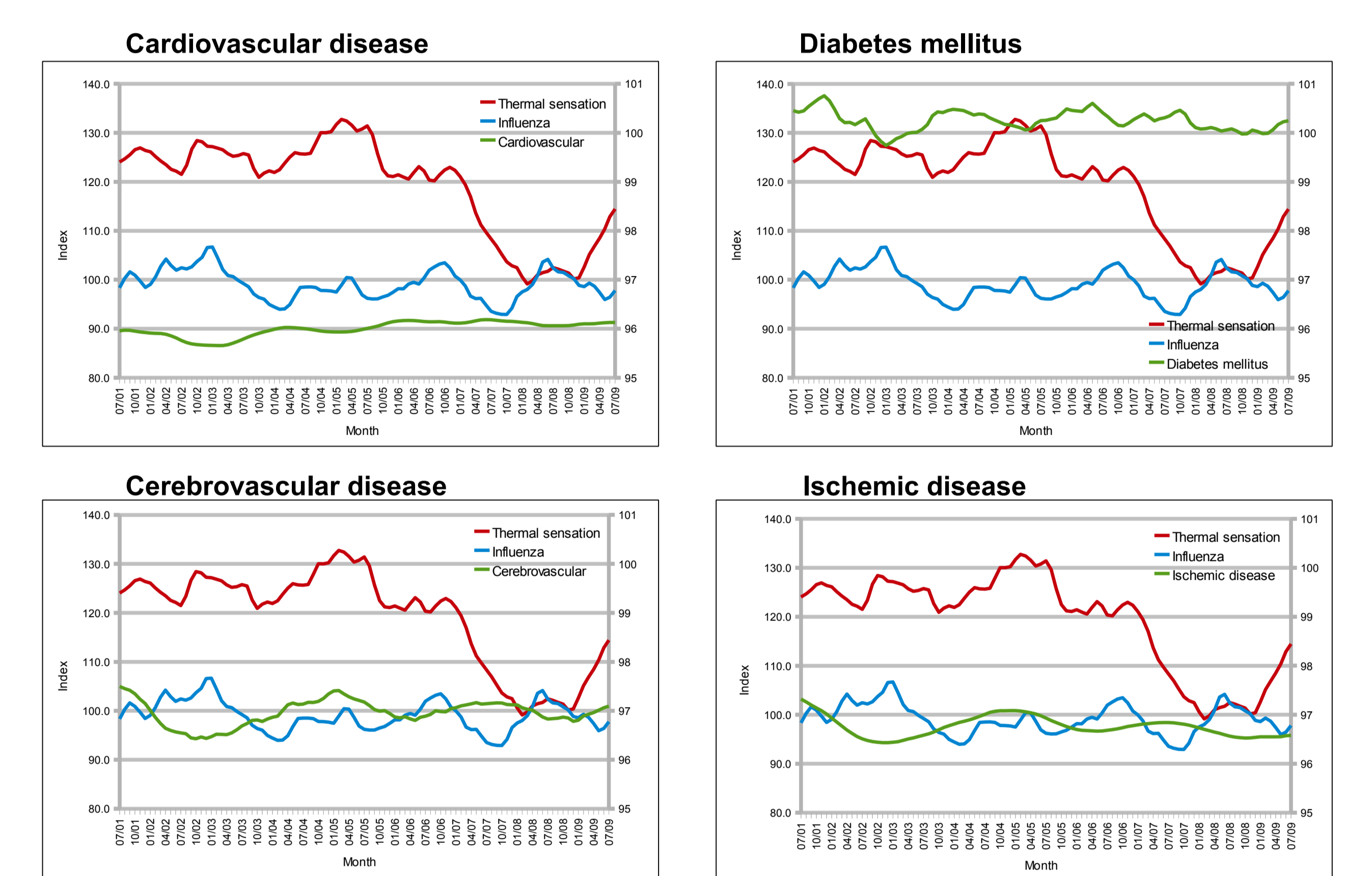
Seasonality of influenza cases, thermal sensation with respect to the mortality from diabetes mellitus, cardiovascular diseases and ischemic disease in people with 65 years and older. Panama. 2001 to 2009.



Seasonal index

Seasonal index of mortality for CV in people 65 years and older association to influenza cases and thermal sensation. There is seasonal relationship between influenza cases and thermal sensation. The same relationship is observed between CV deaths, influenza cases and thermal sensation. IHD has a closer relation with influenza cases and thermal sensation than the other causes of deaths.

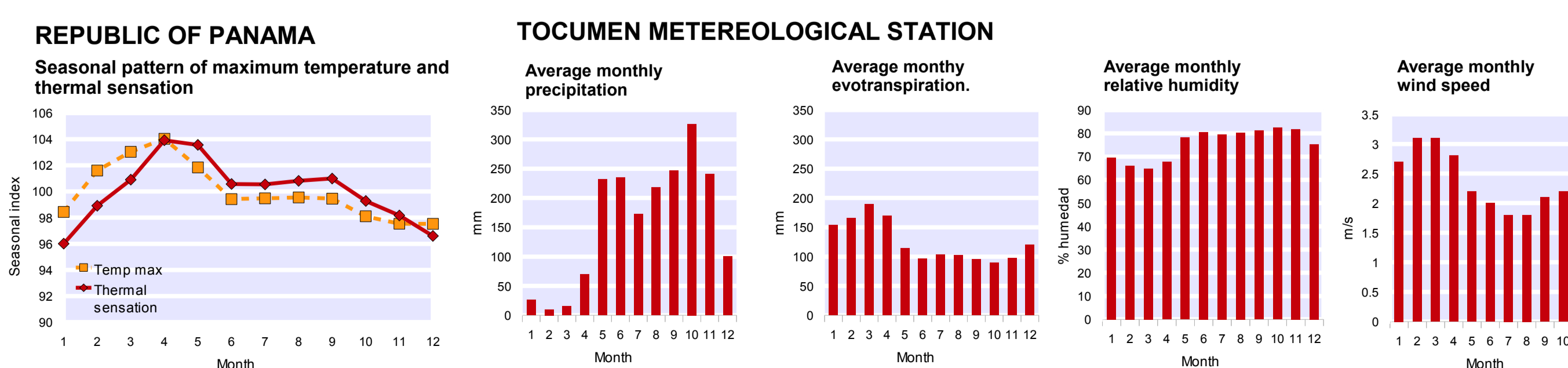
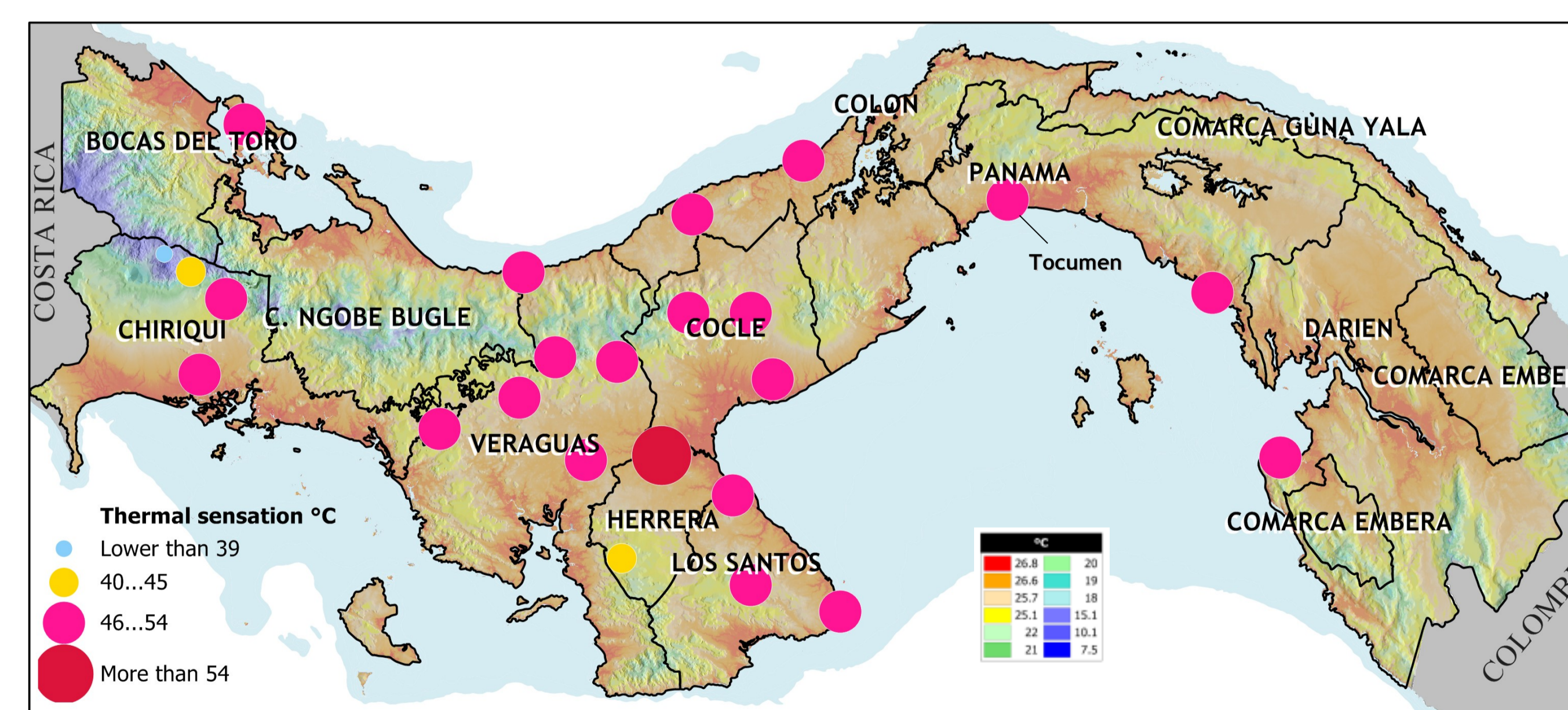
Cycles of influenza cases, thermal sensation with respect to the mortality from diabetes mellitus, cardiovascular diseases and ischemic disease in people with 65 years and older. Panama. 2001 to 2009.



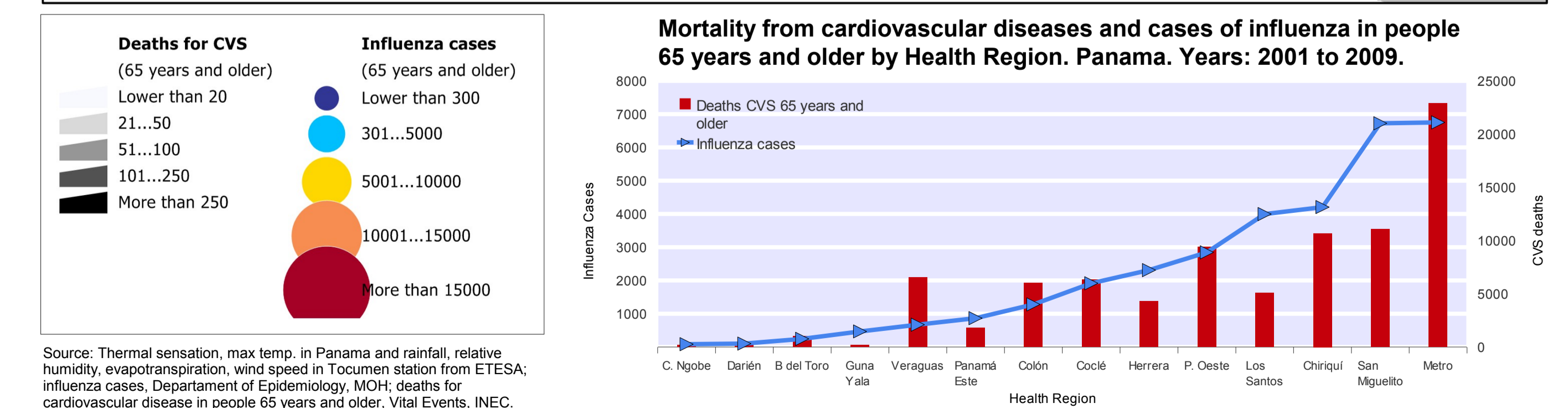
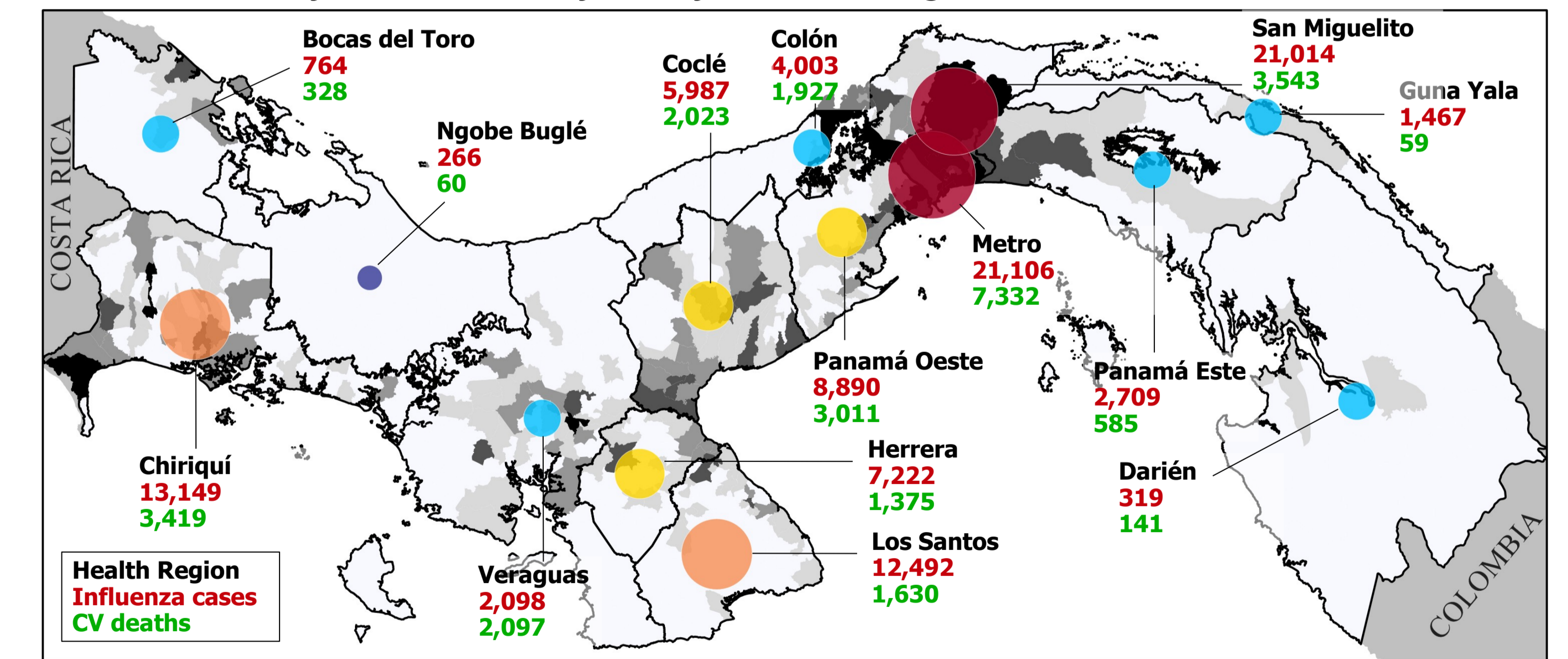
Cycles

Cyclical component of each cause of death in people 65 years and older, are pro-cyclical in the long term in certain time periods. The cyclical oscillations keep relation of influenza cases and thermal sensation. (All death causes, Engle- Granger test, $p < 0.05$)

Temperature and thermal sensation in Panama. 1990 - 2010



Mortality by cardiovascular diseases and cases of influenza in people 65 years and older by county and health region. Panama. 2001 - 2009



Source: Thermal sensation, max temp. in Panama and rainfall, relative humidity, evapotranspiration, wind speed in Tocumen station from ETESA; influenza cases, Department of Epidemiology, MOH; deaths for cardiovascular disease in people 65 years and older, Vital Events, INEC.