

# Retrospective epidemiological study about trends in hospitalizations caused by asthma in Ecuador from 2001 to 2017

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## INTRODUCTION

- Asthma is a frequent non-reported chronic respiratory disease that can vary in severity and may require hospitalization.
- According to the World Health Organization, nearly 235 million individuals suffer from asthma world wide.
- Asthma is reported in all countries independent of their degree of development, but sometimes is not diagnosed appropriately, or there is no adherence to treatment which makes this condition a social burden.
- Environmental factors such as pollutants, allergens and respiratory infections can be attributed to the change in morbidity of asthma.
- Some developing countries with variety of climate regions and asthmogenic factors, like Ecuador, have experienced a variation in hospitalizations caused by asthma throughout the years.

## OBJECTIVES

- To evaluate patterns of asthma morbidity in Ecuador from 2001 to 2017 with respect to its population and climate regions.
- To use the coefficient of determination  $R^2$  to analyze the behavior of asthma morbidity trends across different Ecuadorian climate regions including the Mountainous, Coastal, Amazonian and the Galapagos Islands regions. Asthma morbidity trends will also be assessed across gender and different age groups.
- We aim to find trends that serve as a tool to predict the future status of asthma in Ecuador and in similar developing countries across the region for better health and policy management.

## METHODOLOGY

- We performed an epidemiological study using the rates of hospitalizations caused by asthma in Ecuador from 2001 to 2017.
- Number of cases caused by asthma are based in hospital discharges occurred from 2001 to 2017 which was obtained by the Ecuadorian National Institute of Statistics and Census.
- Cases of asthma are based in gross rates per 10.000 of the population and are under J45 and J46 of the ICD-10, a international classification of diseases of the World Health Organization.
- To calculate trends in asthma morbidity we have used the coefficient of determination ( $R^2$ ); the proportion of the variance in the dependent variable that is predicted from the independent variable.
- According to Hair et al.(2011, 2013)  $R^2$  values become more substantial when the value of  $R^2$  is equal or greater than 0.75<sup>2</sup>. Values are moderate when its  $R^2$  is less than 0.75 but greater than 0.50, and weak when they are less than 0.50.

## RESULTS

Fig 1. Overall of hospitalizations caused by asthma in Ecuador from 2001 to 2017

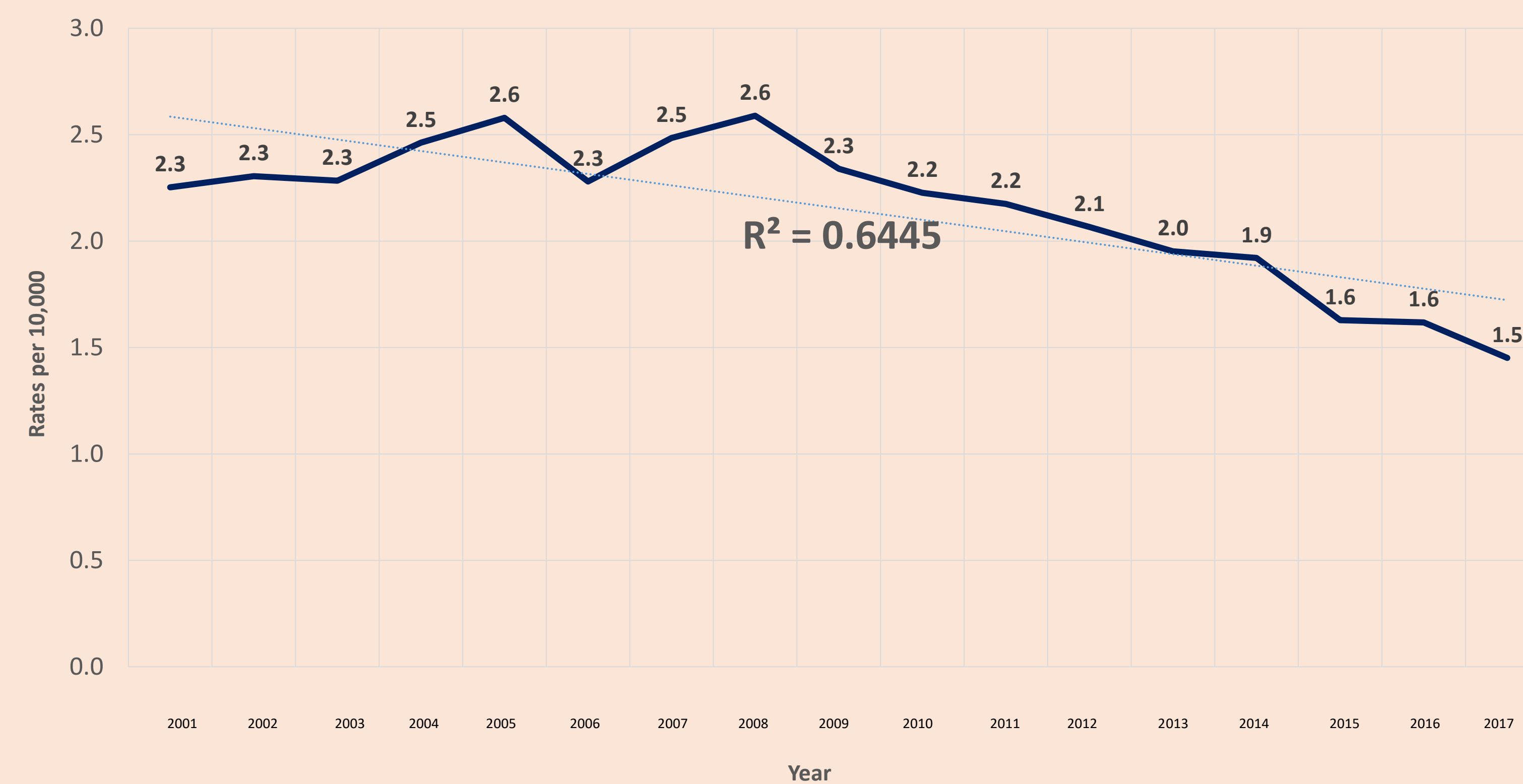


Fig 2. Asthma morbidity based in hospital discharges of individuals living across the four main climate regions of Ecuador (Andes Mountains, Coast, Amazon and Galapagos Islands) from 2001 to 2017

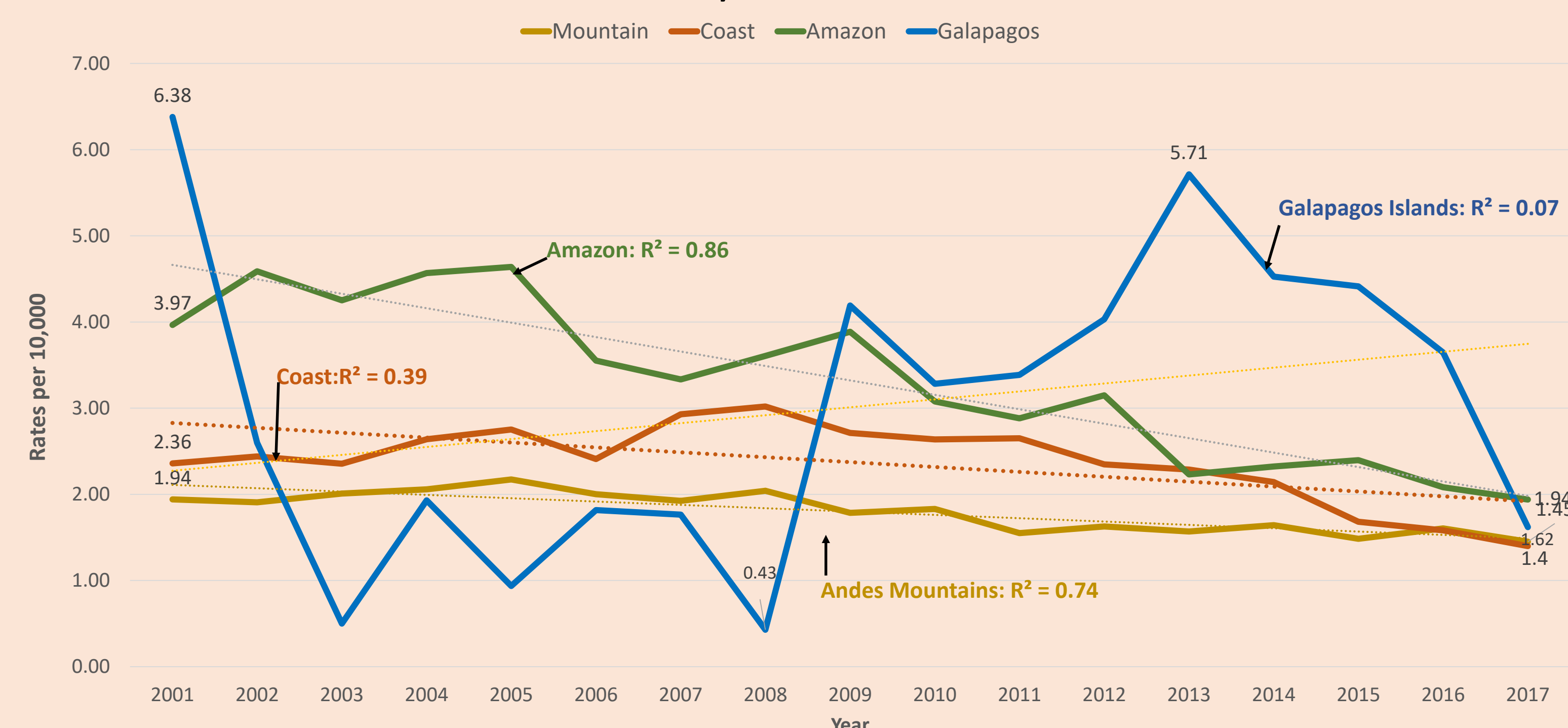


Fig 3. Asthma morbidity rates in Ecuadorian males and females from 2001 to 2017

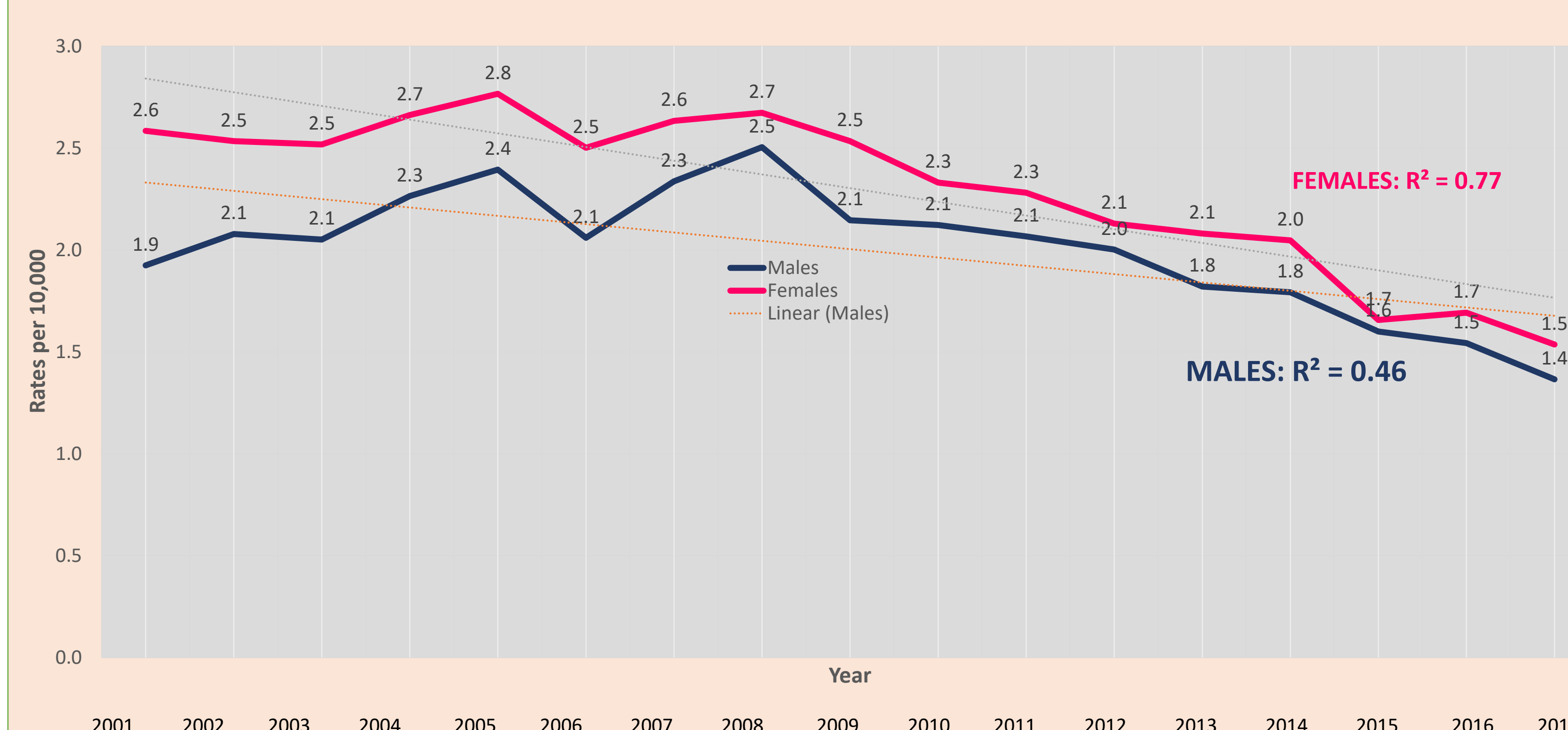


Fig 4. Trends in asthma morbidity across different groups with increasing hospitalizations in Ecuador from 2001 to 2017

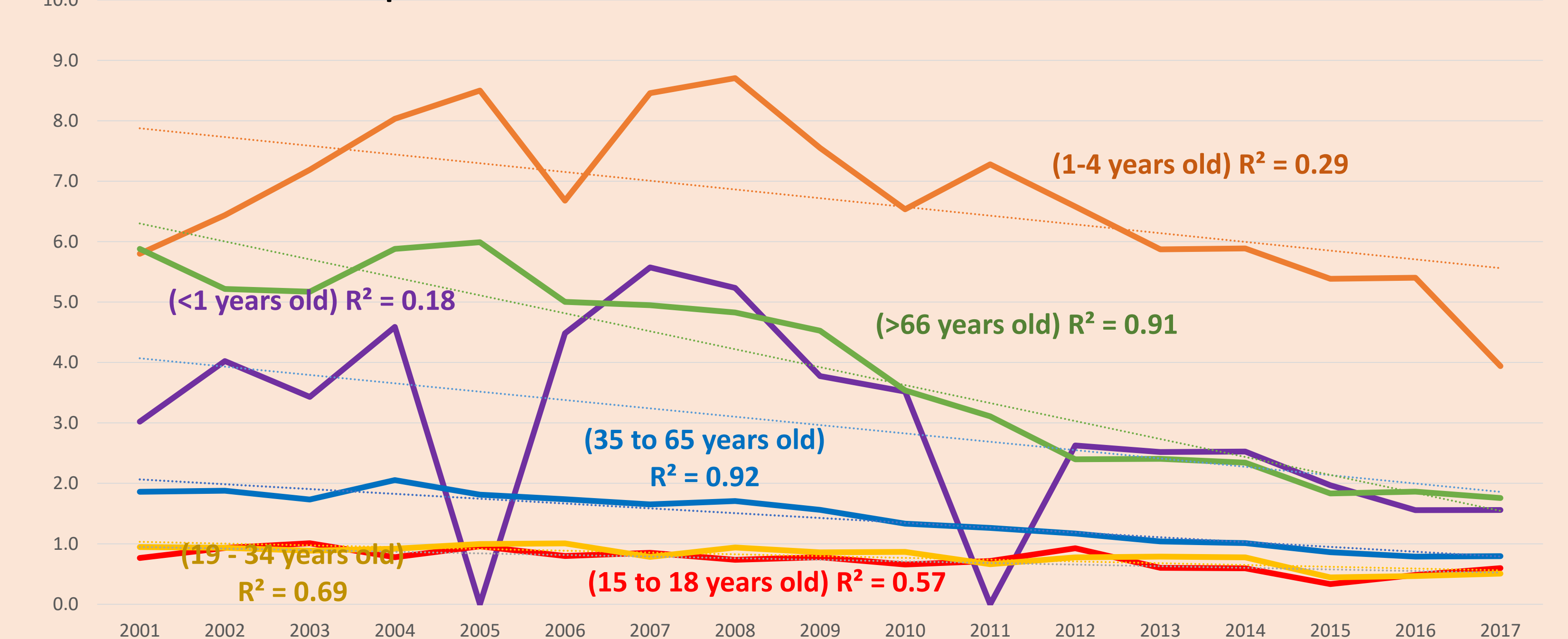
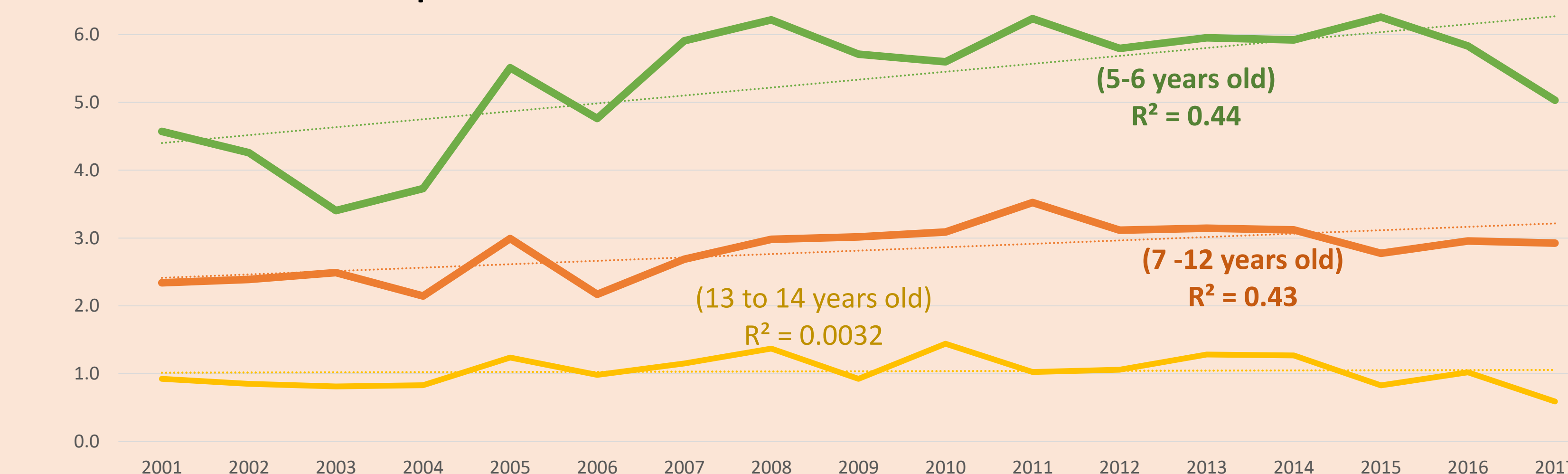


Fig 5. Trends in asthma morbidity across different age groups with decreasing hospitalizations in Ecuador from 2001 to 2017



## DISCUSSION AND CONCLUSION

- Overall, Ecuador has had a moderate declining trend in hospitalizations caused by asthma from 2001 to 2017. Because the calculated  $R^2$  of 0.64 is less than 0.75, it is not a substantial decrease in asthma morbidity. Therefore, it is uncertain whether this trend will decrease or increase over time.
- The Andes Mountainous region ( $R^2$  of 0.74) is expected to have the lowest hospitalization rates compared to other main geographical regions such as the Coastal ( $R^2=0.39$ ), Amazonian ( $R^2=0.86$ ) and Galapagos Islands regions ( $R^2=0.07$ ).
- It is possible that cities located in the Mountainous region such the Ecuadorian Capital, Quito, are becoming reference hospitalization centers for cities in close regions.
- From 2001 to 2017, Ecuadorian males have had lower hospitalization rates than females. However, it is certain that rates in hospitalizations caused by asthma will decrease faster in females ( $R^2=0.77$ ) than in males ( $R^2=0.46$ ) over time.
- From 2001 to 2017 groups of age of less than 1 year old, 1 to 4, 15 to 18, 19 to 34, 35 to 65 and over 66 years old have had decreasing hospitalization rates.
- Age groups going from 5 to 6, 7 to 12, and 13 to 14 have had increasing hospitalization rates from 2001 to 2017. It is possible that children in these groups are exposed to new environments outside their homes. Children around these ages start attending school. Children are exposed to new social environments and become more exposed to allergens and are more likely to suffer from more airway infections related to asthma. Further research is needed in this area.
- It is uncertain whether increasing hospitalization rates in groups aged 5 to 6 ( $R^2 = 0.44$ ), 7 to 12 ( $R^2 = 0.43$ ) and 13 to 14 years ( $R^2 = 0.0032$ ) with moderate and weak  $R^2$  values will increase or decrease over time.
- Groups aged 19 to 34 ( $R^2 = 0.69$ ), 35 to 65 ( $R^2 = 0.92$ ) and over 66 years old ( $R^2=0.91$ ) have moderate and substantial  $R^2$  values and are more likely to have lower hospitalizations rates in the future.

## SOURCES

- Ecuadorian National Institute of Statistics and Census
- World Health Organization