

# PREDICTING HEALTHCARE COSTS IN VENETO REGION WITH ACG SYSTEM: VALIDATION AND COMPARISON OF DIAGNOSIS-BASED AND DRUG-BASED MORBIDITY GROUPS IN A NORTHERN ITALIAN POPULATION

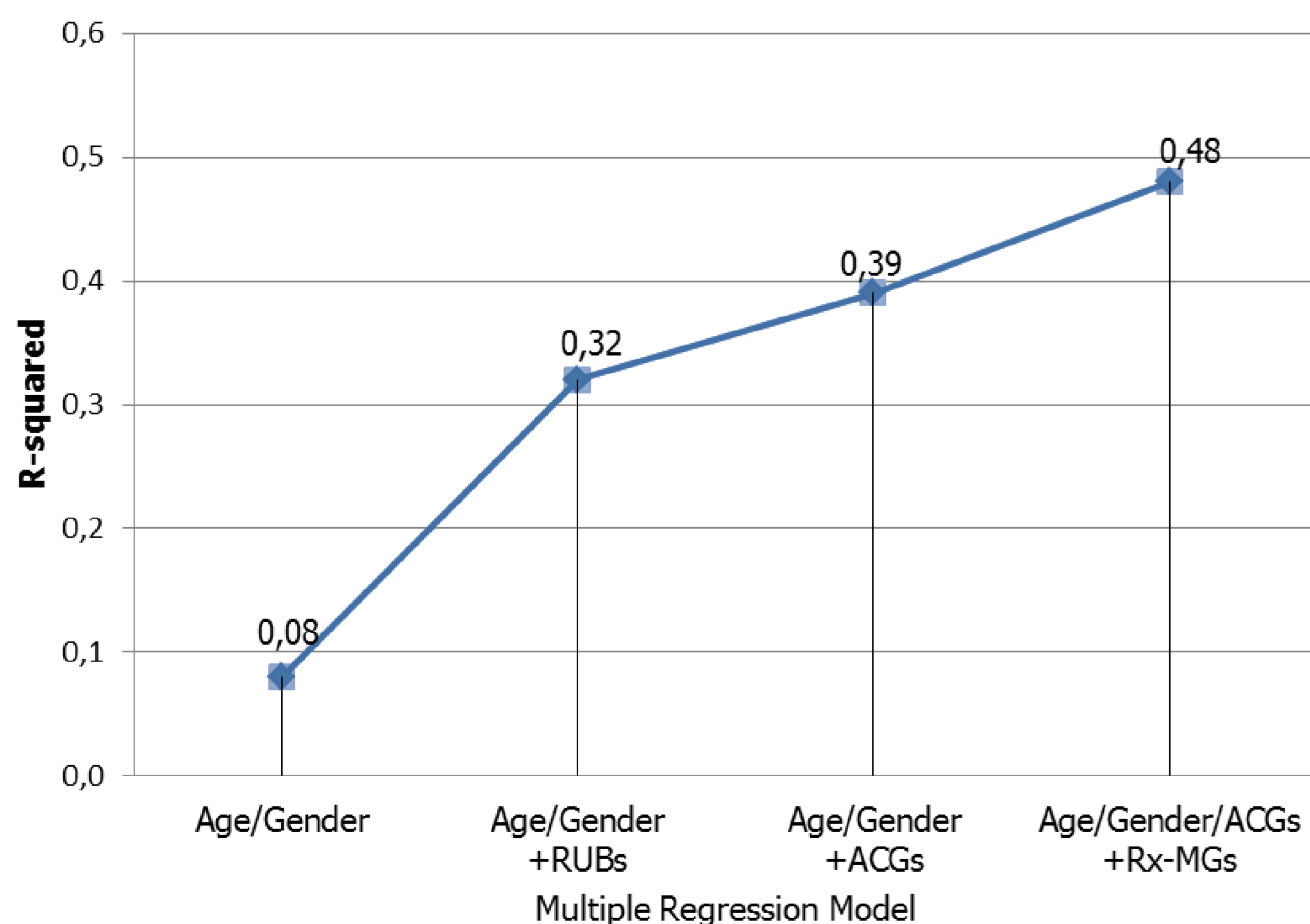
F. Avossa<sup>1</sup>, M.C. Corti<sup>2</sup>, E. Schievano<sup>1</sup>, C. Abrams<sup>3</sup>, N. Alba<sup>4</sup>, S. Elvini<sup>5</sup>, P. Gallina<sup>5</sup>, C. Rampazzo<sup>5</sup>, R. Marchi<sup>4</sup>, M. Saugo<sup>1</sup>, E. Boscolo<sup>2</sup>, D. Scibetta<sup>5</sup>, C. Bovo<sup>4</sup>, D. Mantoan<sup>2</sup>;

<sup>1</sup>SER-Epidemiological Department, Veneto Region; <sup>2</sup>Health Care and Resource Planning Unit, Veneto Region; <sup>3</sup>Johns Hopkins University, Baltimore, MD, USA; <sup>4</sup>Local Health Unit N. 20 Verona; <sup>5</sup>Local Health Unit N. 16 Padova

## Background

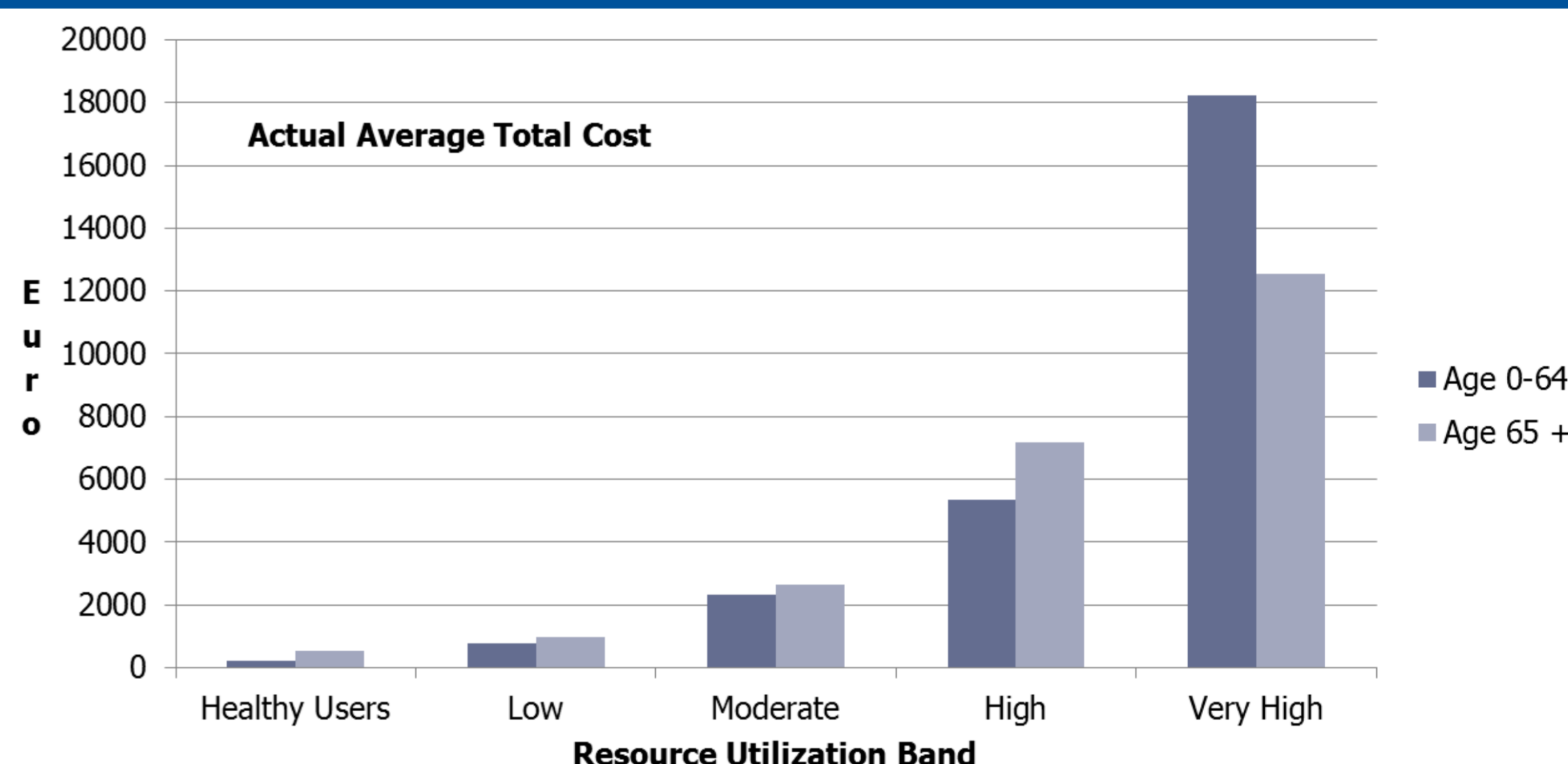
In Veneto (North-Eastern Italy), the Regional Healthcare System (Servizio Sanitario Regionale, SSR) provides universal health coverage to all residents, ensuring primary and hospital care; a copayment is requested only for outpatient services, except for low income people and for patients with specific rare or chronic conditions. Healthcare Services are provided by 21 Local Health Units (LHUs), funded through general taxation on the base of a capitation system so far adjusted only for age, gender and type of living area. Providing a more equitable and efficient method to measure health care needs and to better understand predictors of health care costs is a priority for the Regional Government. For this reason, since 2012 the Veneto Region has been assessing the Adjusted Clinical Groups® (ACG) system as a risk adjustment tool: at the end of 2013 the ACG System was available in six LHUs involving almost 2 million inhabitants, 40% of the Regional population.

The ACG system is a risk-adjustment model that stratifies the population on the basis of clusters of morbidity using diagnostic codes from claims data. The aim of this study is to investigate the relationship between multi-morbidity, as measured by the ACG System, and healthcare costs in Veneto Region. We hypothesize that ACG categories predict health resource use better than age and gender only and that drug-related morbidity groups (Rx-MGs) can improve the explanation of cost variability.



## Methods

A total population of 1,999,218 residents in 6 LHUs of Veneto Region were included in this study. For each individual, data on diagnoses, drugs, procedures and costs experienced during year 2012 were analyzed using the Johns Hopkins University ACG System v.10.0.1. Sources of data were all the routinely available administrative databases (Hospital Discharge Abstracts, ER visits, copayment exemptions, Ambulatory visits, Medications) and the disease registries (Rare diseases, Psychiatry). Total costs were calculated combining inpatient/outpatients fees and medications actual costs. Multi-morbidity was defined using ACG System's illness categories: Resource Utilization Bands (RUBs) and ACG actuarial cells. The relationship between costs and demographic or morbidity variables was evaluated using multiple linear regression models with different explanatory variable sets: age and gender, age/gender and morbidity groups, age/gender/morbidity groups and medications. To evaluate the percentage of variance explained by the models the adjusted R-squared was calculated.



## Results

The "Age/Gender" model explained only 8% of the variance of total costs. The relationship between actual average total costs and RUBs showed that costs increase with increasing levels of comorbidity, but not always with increasing age. So, by adding diagnoses-related predictor variables, such as RUBs and ACG categories, the explanatory power of the model increased to 32% and 39% respectively. Finally, the model including also the Pharmacy-related Morbidity Groups (Rx-MGs) had the highest R-squared (48%).

## Conclusions

In Italy, per capita quotas used by the National Government to finance Regions and by the Regional Governments to finance Local Health Units, are so far adjusted only by age and gender. This study showed that the ACG case-mix System provides a valid measure of health care utilization: measuring health status, mapping co-morbidity and accounting for the case-mix can lead to a better description of health resource use than using age and gender only. The Pharmacy-based diagnoses (Rx-MGs) can also add a new piece of information to the clinical diagnoses contained in the ACG categories: this result is of great interest for the Italian Healthcare System where neither diagnoses from GPs databases nor diagnoses from outpatients visits are completely available yet. The ACG System risk adjustment methodology can be used for planning a more equitable health care resource allocation in the population of Veneto, Italy.