Introduction

In the U.S., diabetes has become one of the major health concerns. In like manner, health insurance coverage is vital to the health needs of individuals. Adults having elevated glucose levels are recommended to receive glycated hemoglobin (HbA1c) testing to determine the average blood sugar concentrations. Differences in insurance coverage has significant impact on recommended screenings.

The study analyzes secondary data from 2011 to 2013 on three different health plans being Medicaid, Blue Care Network (BCN) and Blue Cross Blue Shield (BCBS) of Michigan. Statistical methods were used to ascertain the best regression model for count data and the association between county specific health and socioeconomic factors and insurance plans associated with the HbA1c testing.

The study finds the negative binomial model is best in predicting count health data. Also, urban-rural interaction and type of insurance plans are key in understanding patterns and frequency of diabetes service utilization. The BCBS plan has more people taking the required HbA1c test compared to the BCN and Medicaid. Across all plans, analysis indicate that interventions should be focused on the southern part of Michigan. Further, health and socioeconomic factors determine the rate and frequency of the HbA1c screening.

Objectives

▪ Identify the best model for predicting count secondary health data
▪ The association between screening rates and socioeconomic factors.
▪ HbA1c testing rates in Michigan on county level to identify areas with lower testing rates and geographic patterns
▪ Does HbA1c testing rates vary by insurance type (public/private)

Study Design

▪ Secondary data analyses of 2011-2013 Michigan Medicaid, BCN and BCBS (non-governement sponsored health insurance provider) recipients with diagnosed diabetes
▪ Cases were analyzed Medicaid, BCN and BCBS were n=427,337
▪ Eligibility: 18 years or older and alive
▪ Had previous been screened with diabetes
▪ in the insurance plan for at least 12 consecutive months during the 3 year study period
▪ Diagnostics
● A1C testing at least once per year (yes/no)
● County of residence
▪ Analysis
● Statistical analysis was conducted in R
● Poisson regression
● Negative binomial regression
● Model selection using AIC, Young test and Residual Deviance
● Residual analysis
● Age/GIS 10-47 used for mapping
● Individual cases were aggregated into county of residence
● County HbA1c screening rates computed by insurance type

Results

▪ The Poisson model yielded higher AIC values and over-stated the significance of all the covariates.
▪ Ignoring over dispersion leads to wrong statistical inference which further lead to an inaccurate conclusion
▪ Thus, prior to selecting statistical model to be used for count health data analysis, it is essential to consider the distribution of the data to ascertain the dispersion of the data

Model Selection

▪ Countries where there is lesser exercising and engagement in physical activity have a significant increase in HbA1c testing
▪ As poverty increases across the various counties, the more people get their HbA1c testing
▪ Countries with more minorities record the higher number of people taking the HbA1c test (significant only in 2011)
▪ Countries where there is lesser exercising and engagement in physical activity have a significant increase in HbA1c testing
▪ Penalties for non-participation in various counties increases more people receive HbA1c testing
▪ Poverty is insignificant (not a key factor)

Model Selection Highlight

▪ The Poisson model yielded higher AIC values and over-stated the significance of all the covariates.
▪ Ignoring over dispersion leads to wrong statistical inference which further lead to an inaccurate conclusion
▪ Thus, prior to selecting statistical model to be used for count health data analysis, it is essential to consider the distribution of the data to ascertain the dispersion of the data

Residual Analysis

▪ Less people within each county get the HbA1c testing as education increases
▪ Countries with higher physical activity record higher screening rates more people taking the test
▪ Socioeconomic and health factors have similar associations for both BCN and BCBS though the parameter estimates

Key Similarities Across Insurance Plans

▪ Countries with lower physical activity record lower screening rates more people taking the test

Discussion and Conclusions

▪ Noticeable variations across the counties of Michigan (southern MI)
▪ Exercising and engaging in any physical activity does not influence a person’s health

Strengths

▪ Data for selection criteria was available for entire states
▪ Multiple years were examined
▪ No missing data was identified

Limitations

▪ Could not examine causality
▪ Secondary data
▪ Differences in population across plans was not examined

References


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