

# Analysis of demographic factors that determine the insurance premiums and health coverage in Illinois



MIS 536 Final Project - Group 2

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# OBJECTIVE

Analysis of demographic factors that determine the insurance premiums and health coverage for families in the urban and rural counties in Illinois

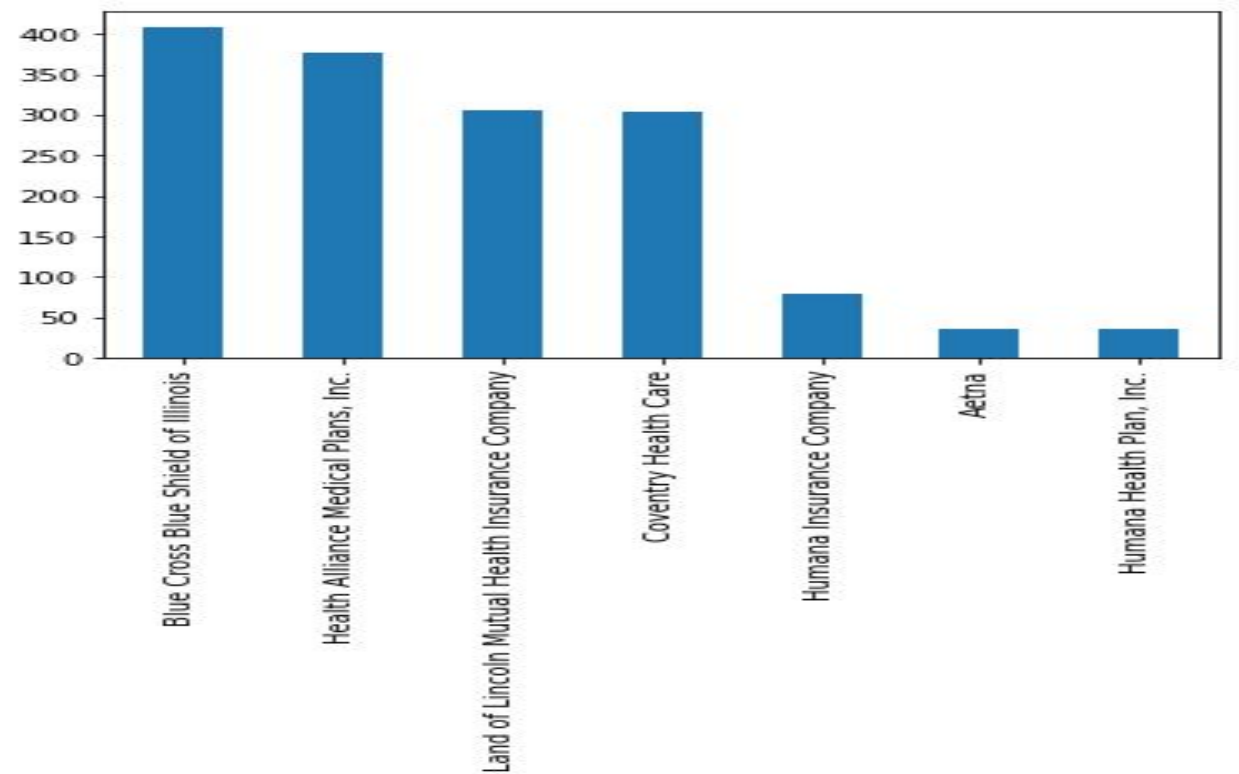
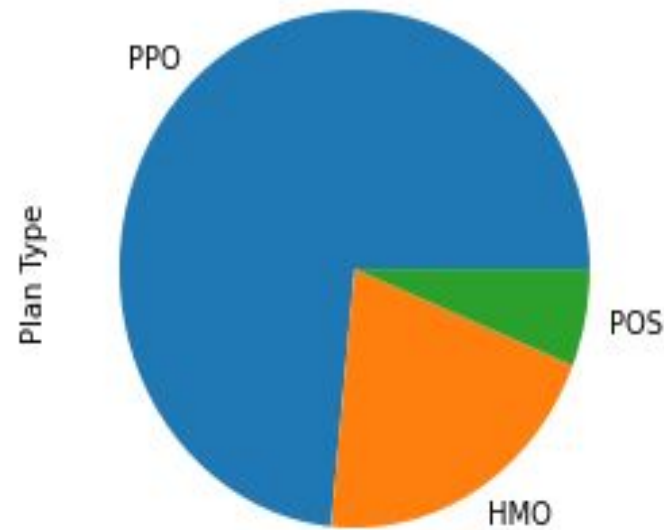
- Influence of population
- Influence of per capita income and unemployment rates with uninsured children
- Influence of age of parents
- Influence of primary care access
- Insurance companies and their plans available for different age groups
- Deductible and out of the pocket expense for different insurance plans

# DATA DESCRIPTION

- Total datapoints:1545
- Total number of columns:61
- Data types: Categorical and Float
- Demographic information: Population, Income,State, County,County Type,Rating Area, Uninsured population
- Insurance Information: Insurance issuers, Plans, Metal levels, premiums, deductible and out of pocket expense for different categories and age groups

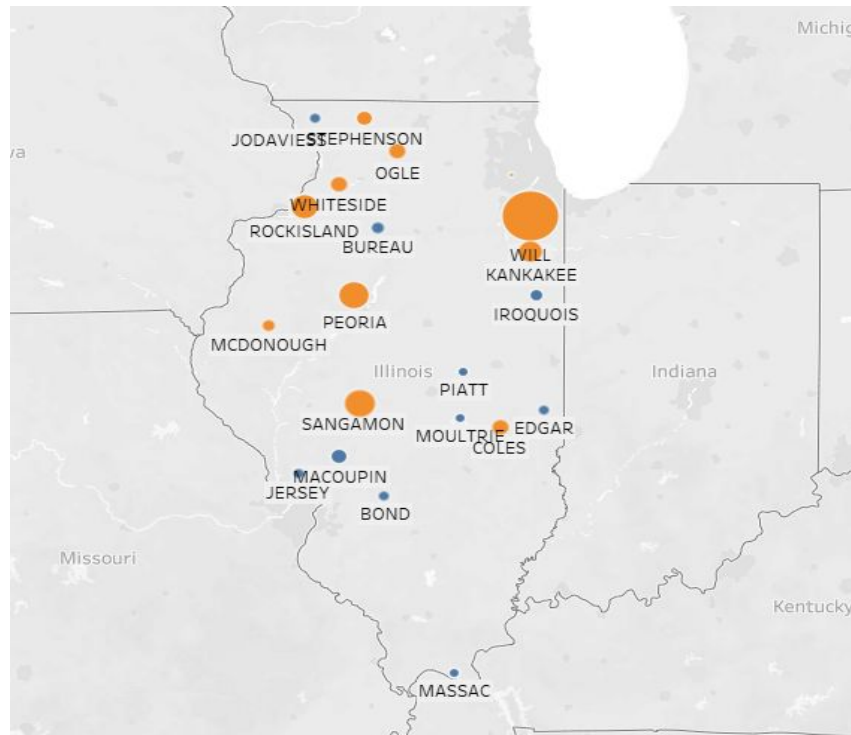
# INTRODUCTION

- Total Population in Illinois is 227,825,282
- 94% live in urban counties while remaining 6% live in rural counties
- Insurance companies and their plan types shown below

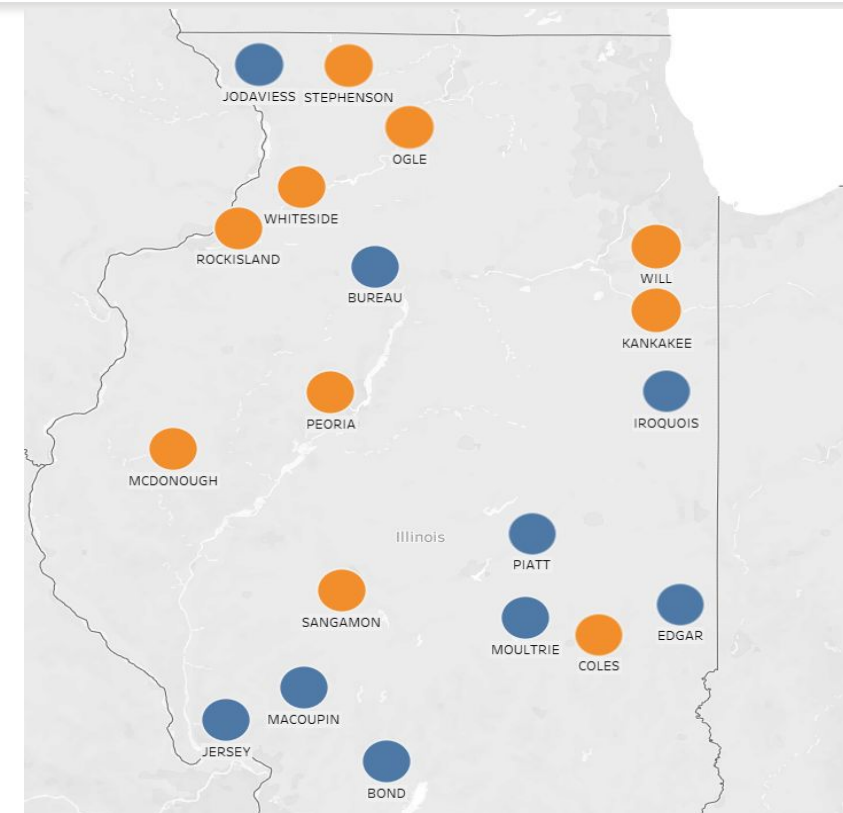
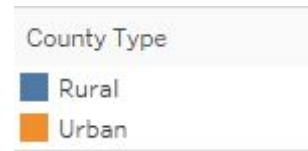


# POPULATION VERSUS PREMIUMS

- Population in the urban area is much higher than the rural
- Insurance premiums show no dependence on these factors

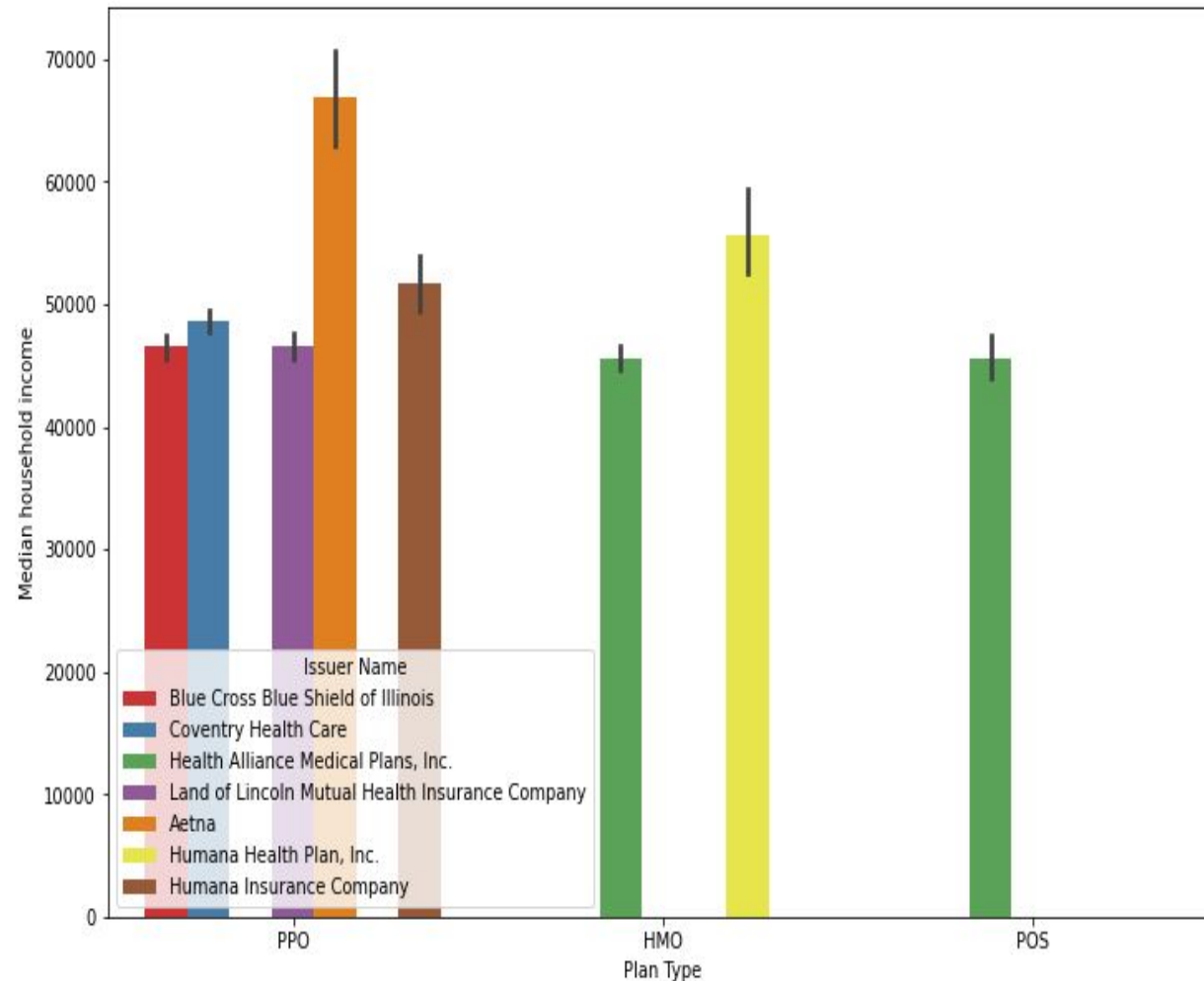


Population in urban and rural counties



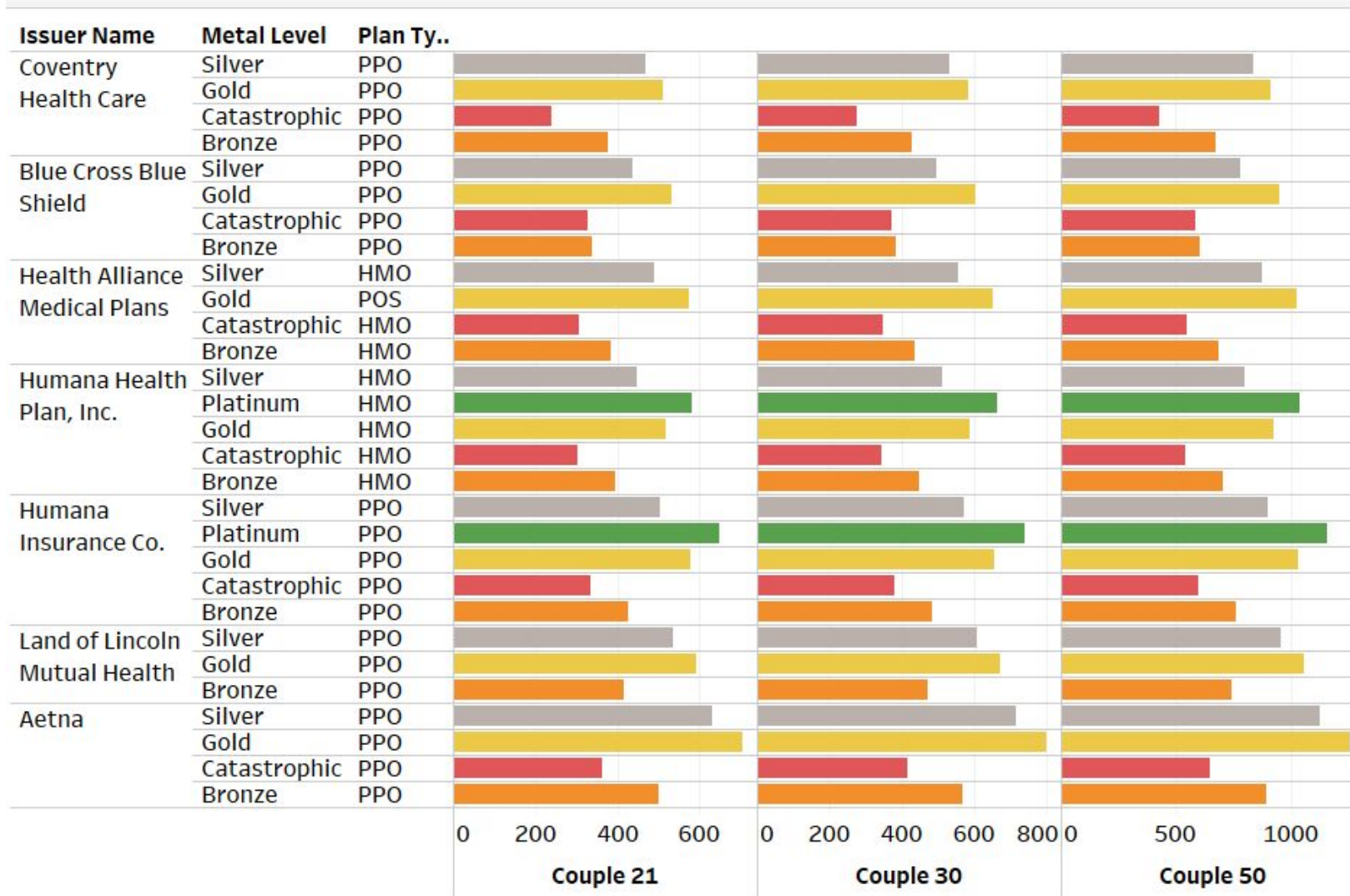
Insurance premium for Couple+2 children

# MEDIAN HOUSEHOLD INCOME AND INSURANCE



- Total Population in Illinois is 227,825,282

# PLAN PROVIDER BY AGE, BRAND AND CATEGORY FOR INDIVIDUAL AND COUPLES

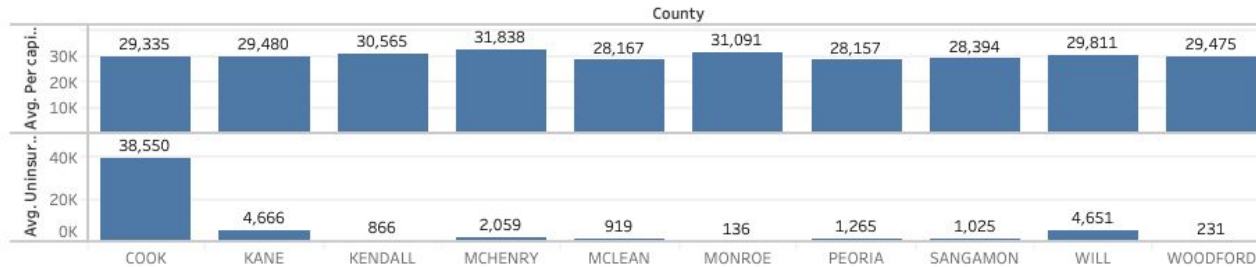


- Couples pay higher premiums as they age
- Percentage change in premium from age group 21 to 30 is 13.5%, from 30 to 50 is 57.35% and from 21 to 50 is 78.6% across all issuers, insurance plans and metal levels

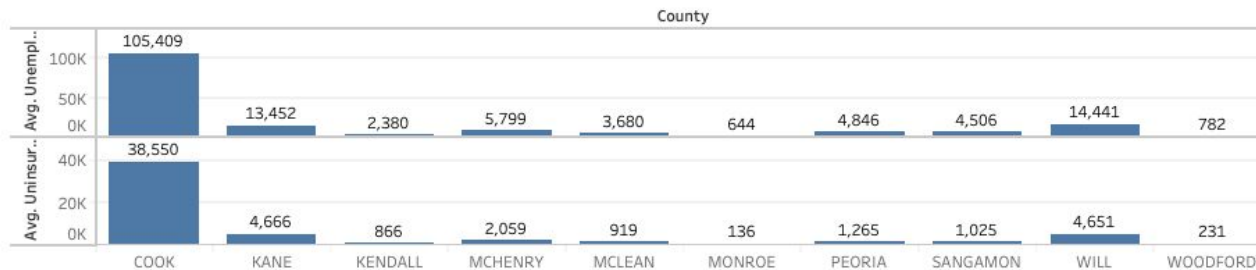


# Uninsured versus unemployment

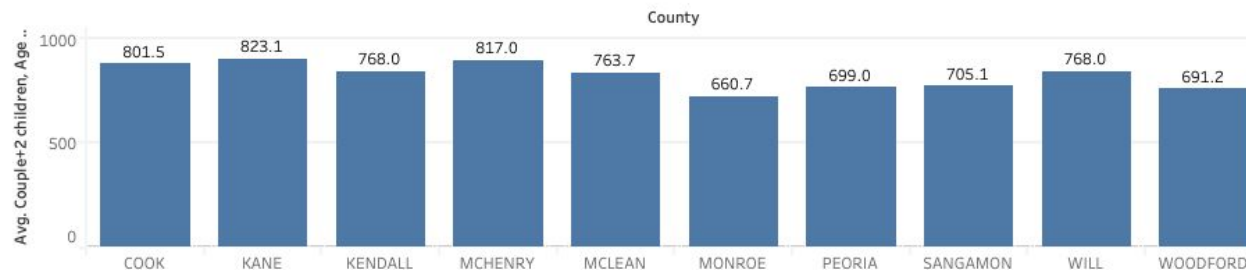
INCOME VS UNINSURED CHILDREN



UNEMPLOYMENT VS UNINSURED CHILDREN



COUPLE WITH 2 CHILDREN

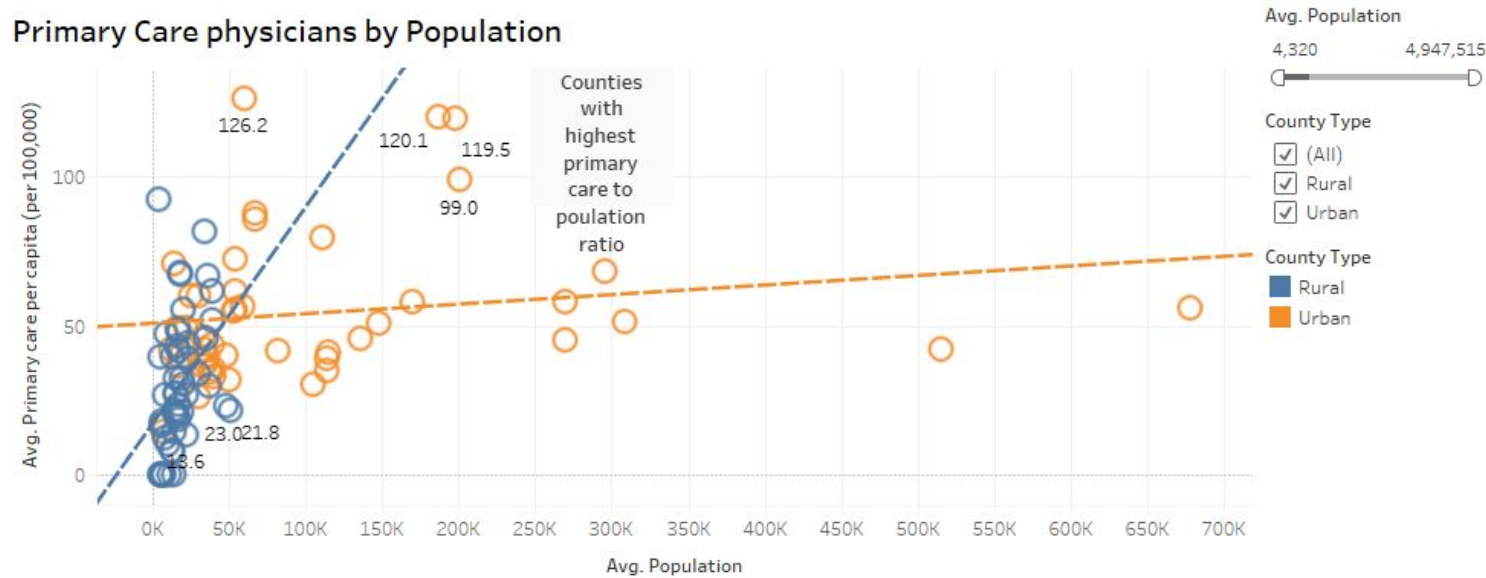


- Trend on per capita and uninsured children versus premium for couple plus two children
- Per capita income vs unemployment is high in Cook county



# Primary care by population

Primary Care physicians by Population

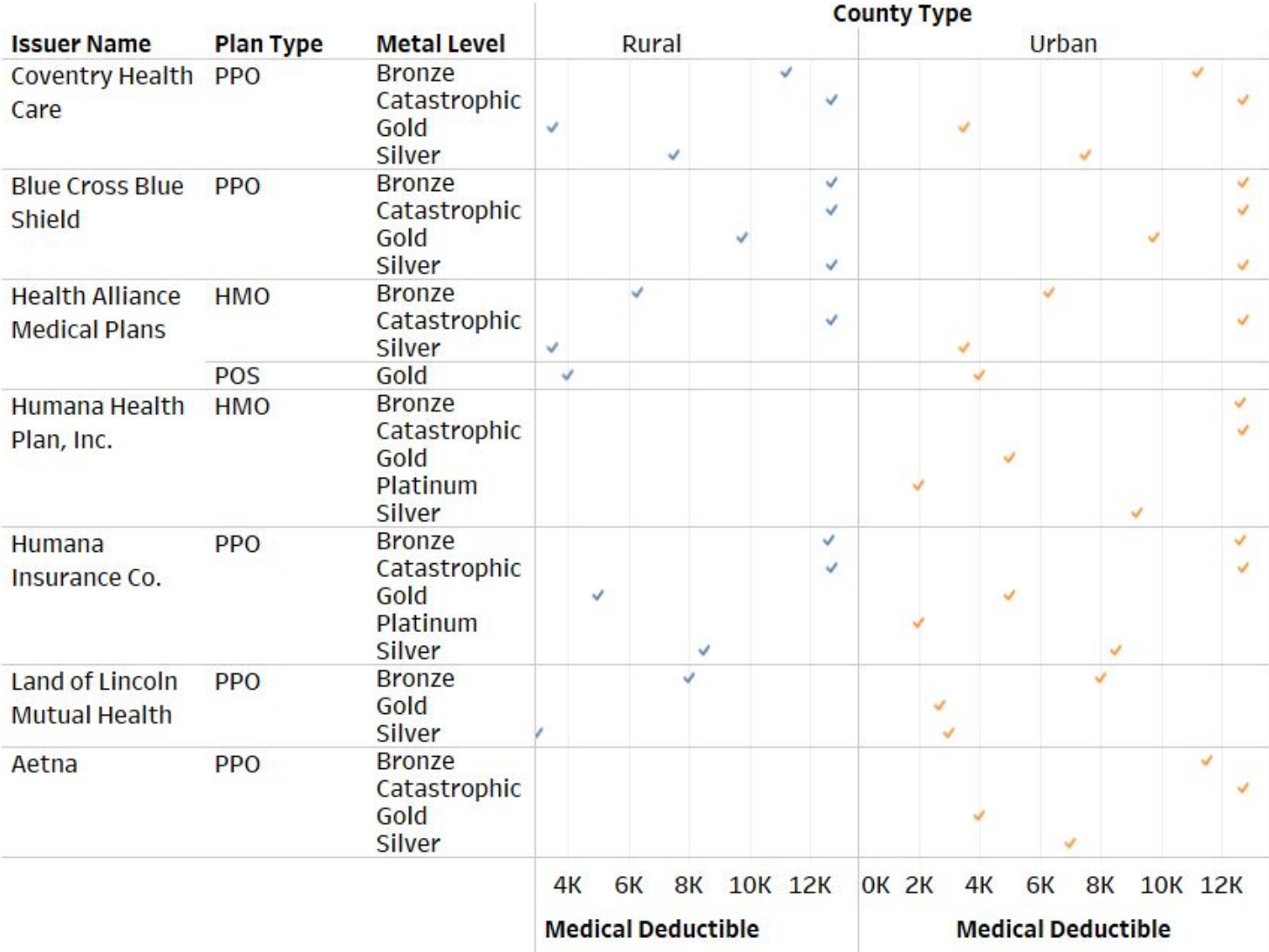


- Primary care to population ratio above 25 is a healthy ratio
- Primary care to population ratio show a much wider disparity for rural compared to urban counties
- Rural area premiums are lower than urban but not enough to address the disparity
- Insurance premiums do not show that disparity

Couples of age groups 21 and 30 with 1, 2 and 3 children

County Type	Metal Level	Couple+1 child,21	Couple+1 child,30	Couple+2 children..	Couple+2 children..	Couple+3 or more ..	Couple+3 or more ..
Rural	Bronze	499.5	550.7	619.9	671.1	740.3	791.5
	Catastrophic	392.0	432.1	486.4	526.6	580.9	621.0
	Gold	731.0	805.9	907.1	982.0	1,083.3	1,158.2
	Platinum	808.9	891.8	1,003.9	1,086.7	1,198.8	1,281.7
	Silver	635.8	700.9	789.0	854.2	942.2	1,007.4
Urban	Bronze	510.4	562.7	633.4	685.7	756.4	808.7
	Catastrophic	398.9	439.7	495.0	535.9	591.1	632.0
	Gold	739.5	815.2	917.7	993.4	1,095.9	1,171.6
	Platinum	834.6	920.1	1,035.7	1,121.2	1,236.9	1,322.3
	Silver	645.2	711.3	800.7	866.8	956.2	1,022.3

# Medical Deductible



# Medical Out of Pocket Expense

Issuer Name	Plan Type	Metal Level	County Type												
			Rural			Urban									
Coventry Health Care	PPO	Bronze					✓					✓			
		Catastrophic					✓					✓			
		Gold				✓					✓				
		Silver					✓					✓			
Blue Cross Blue Shield	PPO	Bronze					✓					✓			
		Catastrophic					✓					✓			
		Gold				✓				✓		✓			
		Silver					✓					✓			
Health Alliance Medical Plans	HMO	Bronze					✓					✓			
		Catastrophic					✓					✓			
	POS	Gold		✓						✓					
Humana Health Plan, Inc.	HMO	Bronze											✓		
		Catastrophic											✓		
		Gold									✓				
		Platinum								✓					
Humana Insurance Co.	PPO	Silver											✓		
		Bronze						✓					✓		
		Catastrophic				✓							✓		
		Gold	✓							✓					
Land of Lincoln Mutual Health	PPO	Platinum											✓		
		Silver						✓							
		Bronze						✓					✓		
		Gold		✓							✓				
Aetna	PPO	Silver											✓		
		Bronze											✓		
		Catastrophic										✓			
		Gold										✓			
		Silver										✓			
			2K	4K	6K	8K	10K	12K	0K	2K	4K	6K	8K	10K	12K
			Medical Maximum Out of Pocket						Medical Maximum Out of Pocket						

2K 4K 6K 8K 10K 12K

### Medical Maximum Out of Pocket

### County Type

Rural

Urban

0K 2K 4K 6K 8K 10K 12K

### Medical Maximum Out of Pocket

# Machine Learning Model Results

Outcome	Significant factors	Performance metrics
Couple premium age group 21 + 2 children	Metal level Catastrophic, Bronze, Issuer Coventry and Aetna, Blue Cross Blue Shield, Meta levels gold and silver Area rating had much smaller importance	MAE: 23.4 RMSE: 36.46 R2: 0.9633
Couple premium age group 30 + 2 children	Meta levels Catastrophic, bronze, silver, gold Issuers like Blue Cross Blue shield and Land of Lincoln Mutual Health	MAE: 25.566 RMSE: 39.958 R2: 0.9624
Couple premium age group 50+ 2 children	Meta levels Catastrophic, bronze, silver, gold Issuers like Blue Cross Blue shield and Land of Lincoln Mutual Health , rating areas 7,6,8	MAE: 34.928 RMSE: 54.67 R2: 0.9625

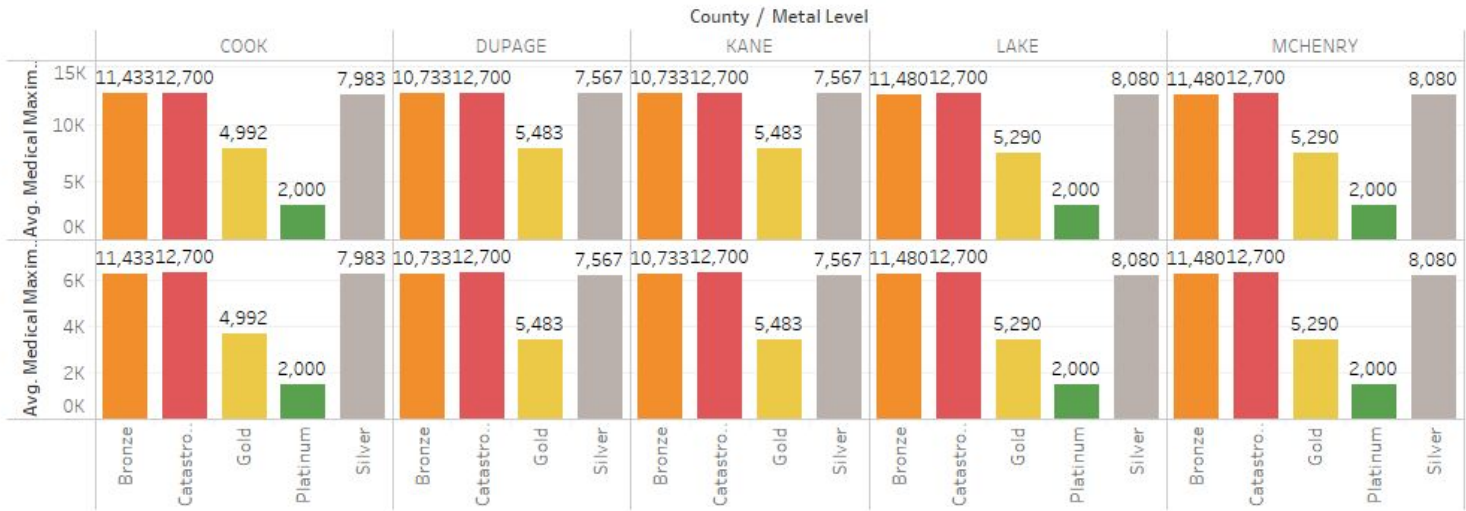
# CONCLUSION AND FUTURE SCOPE

- Though there exists a clear divide between the rural and urban counties in terms of population, income and primary care access insurance premiums do not address this.
- The issuer and metal level of the plan strongly influences the premiums
- The premiums have a dependence on the age group of parents in families

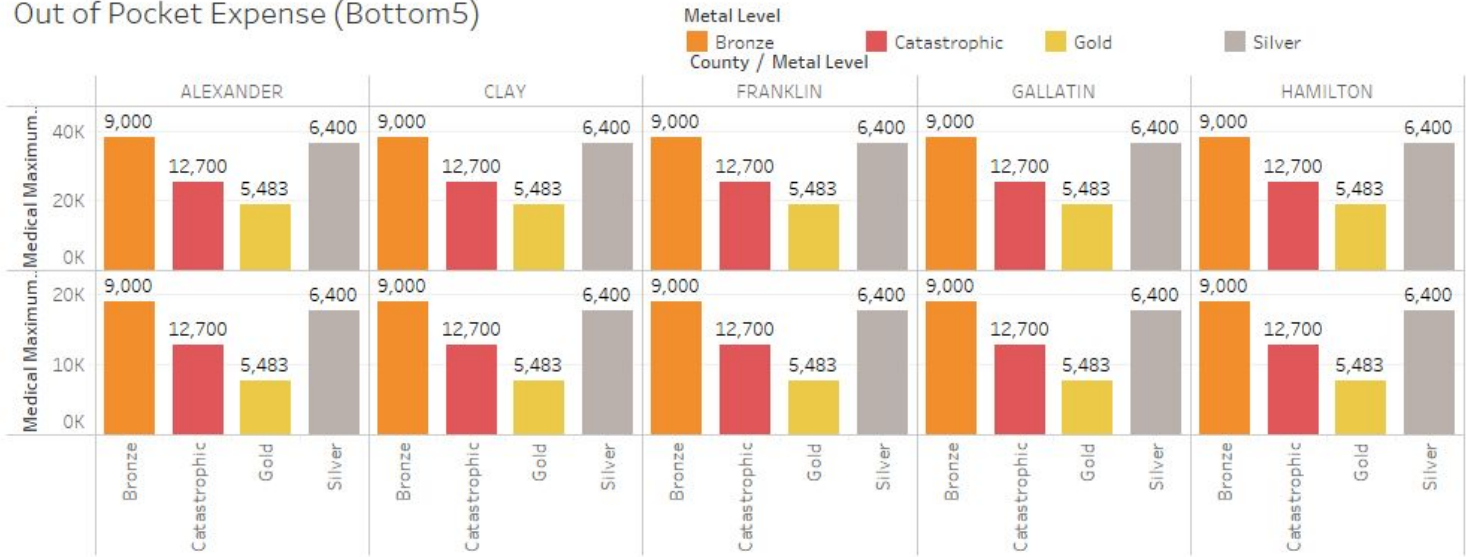
Story 1

Primary care to population ratio and family premiums	Primary care to population ratio and family premiums	Primary care to population ratio and family premiums	Medical deductible	Out of Pocket Expense	Plan provider by Age, Brand and category for individual and couples
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Out of Pocket Expense (Top 5)



Out of Pocket Expense (Bottom5)





# Story 1

Primary care to population ratio and family premiums

Primary care to population ratio and family premiums

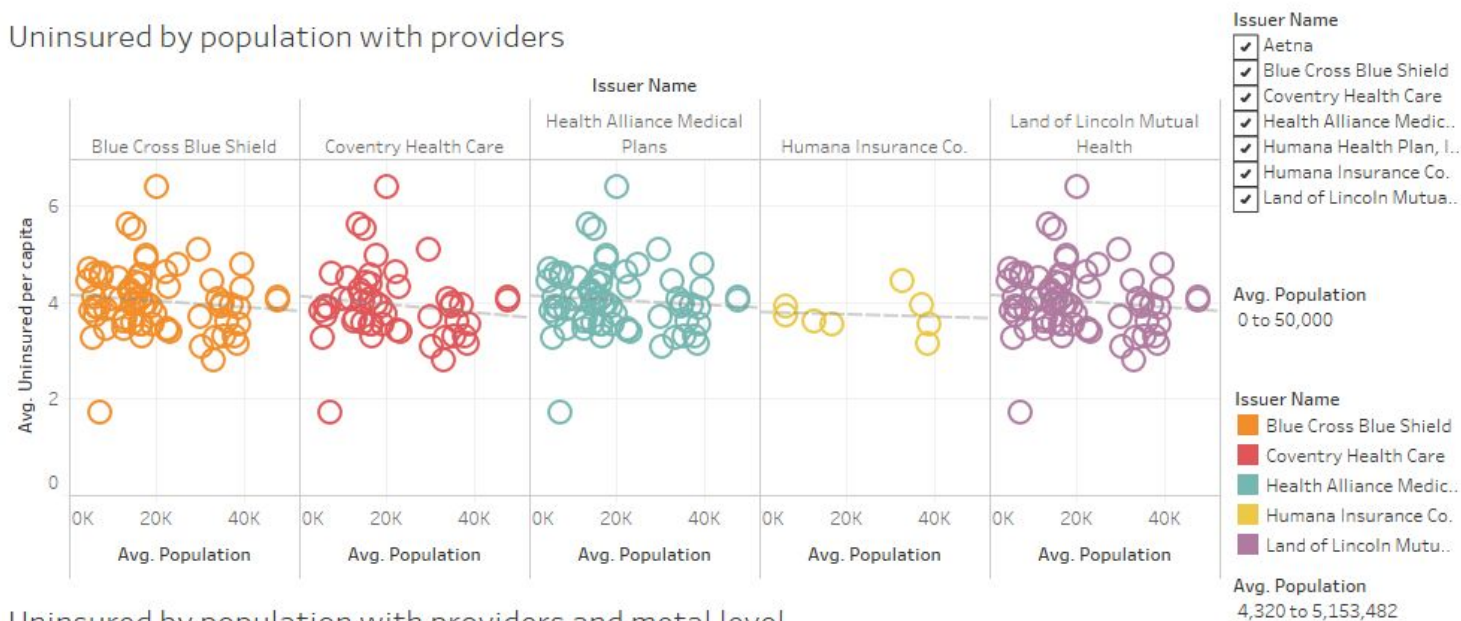
Primary care to population ratio and family premiums

Medical deductible

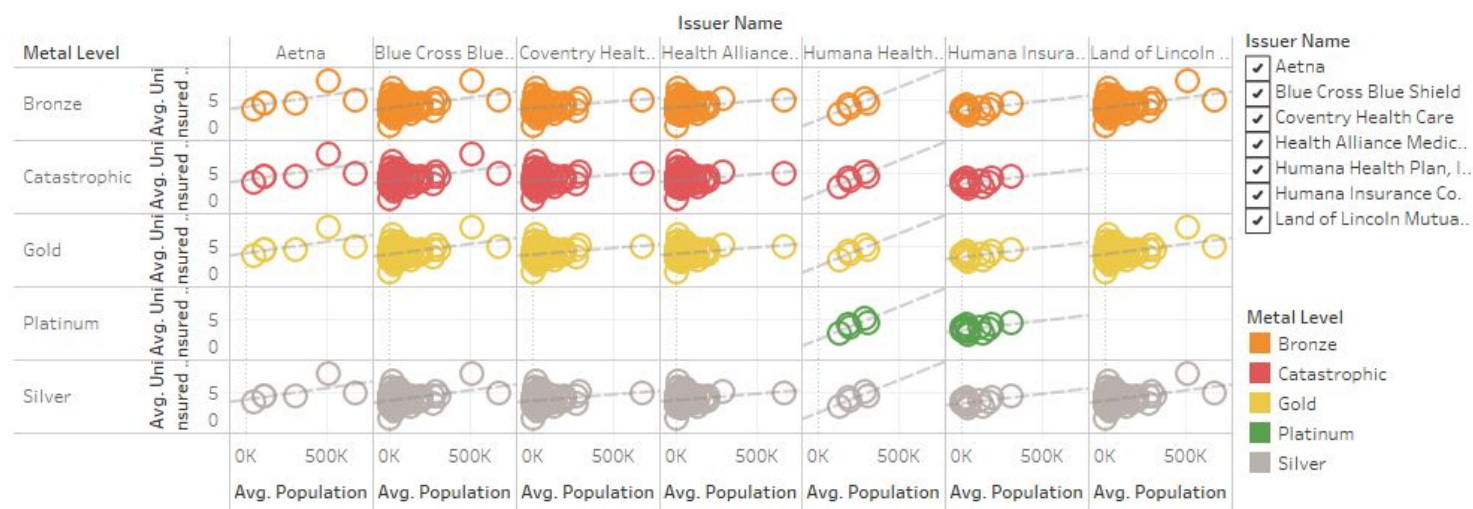
Out of Pocket Expense

Plan provider by Age, Brand and category for individual and couples

## Uninsured by population with providers



## Uninsured by population with providers and metal level





Story 1

Primary care to population ratio and family premiums	Primary care to population ratio and family premiums	Primary care to population ratio and family premiums	Medical deductible	Out of Pocket Expense	Plan provider by Age, Brand and category for individual and couples
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Sample plan per provider by age

