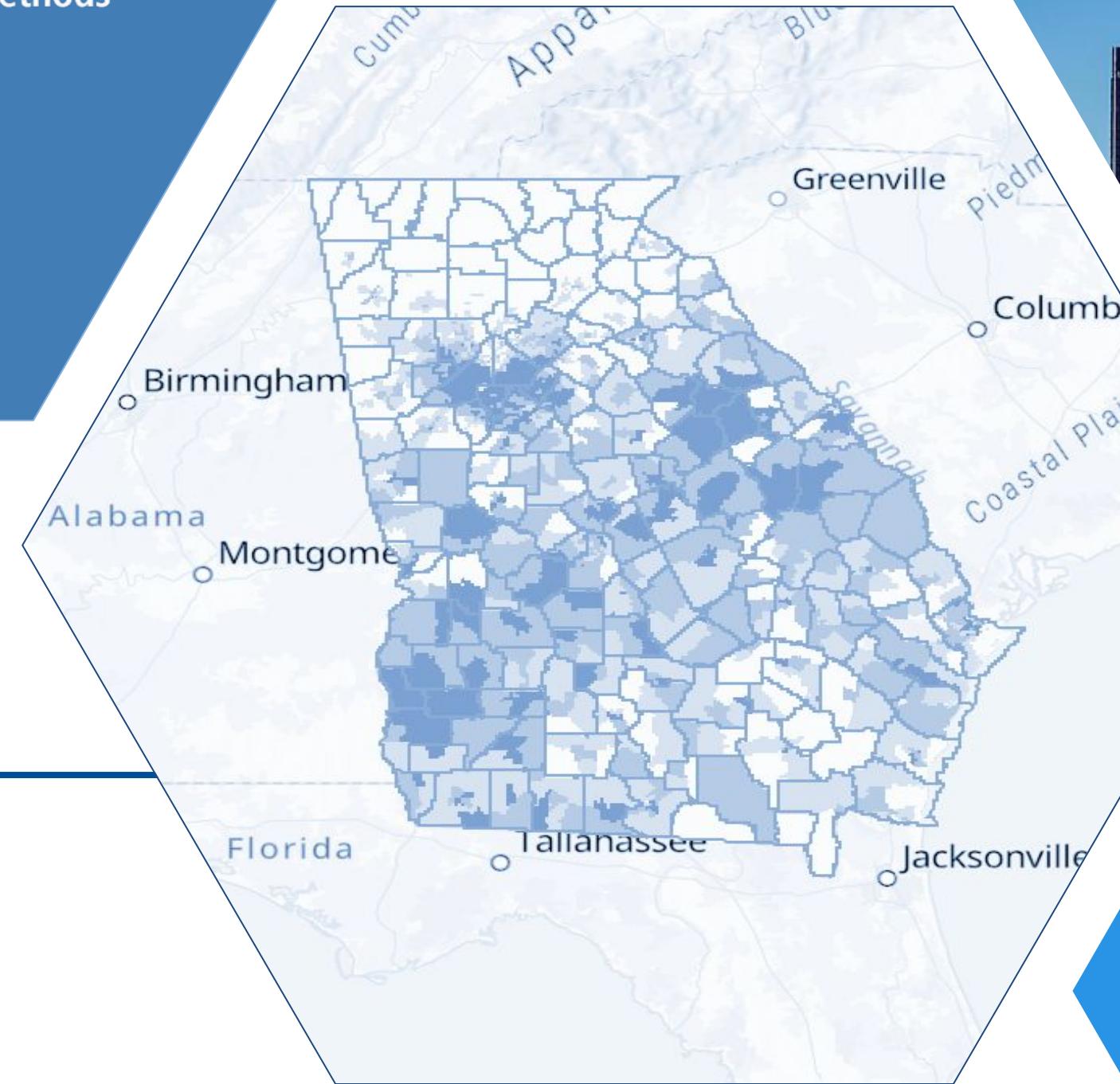




EMORY  
COLLEGE  
OF ARTS AND  
SCIENCES

Department of Quantitative  
Theory and Methods

ARC



# Summer 2023 Data Practicum: Population Prediction

# Table of Contents



About Us



Introduction



Collecting Data



Building Models



Results



Next Steps

# 01. About Us

---

# Meet Our Team



**Mario  
Sánchez del  
Campo**  
Quantitative  
Sciences  
(Biology)



**Julia Hu**  
Applied Math



**Ellen Dong**  
Applied Math  
& Statistics +  
Economics



**James Park**  
Quantitative  
Sciences  
(Computer  
Science)



**Olivia Moody**  
Quantitative  
Sciences  
(Political  
Science)

# 02. Introduction

---

# Goals

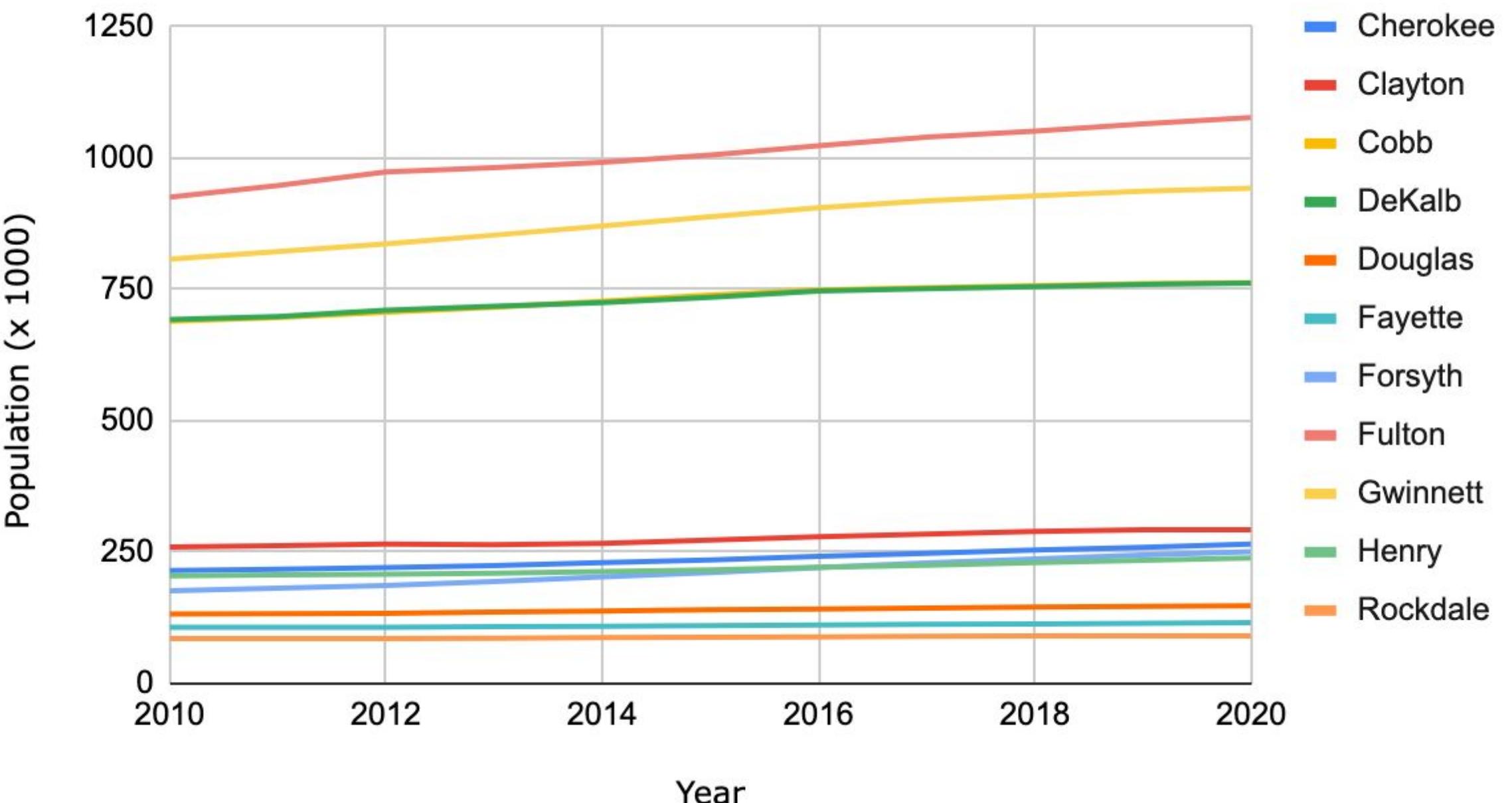
## Modelling Growth

Building a model that mirrors the population growth in ATL Metro-11 area (2010-2020)

## Predicting Growth

Predicting the future population growth for each year in each county (2021 - 2050)

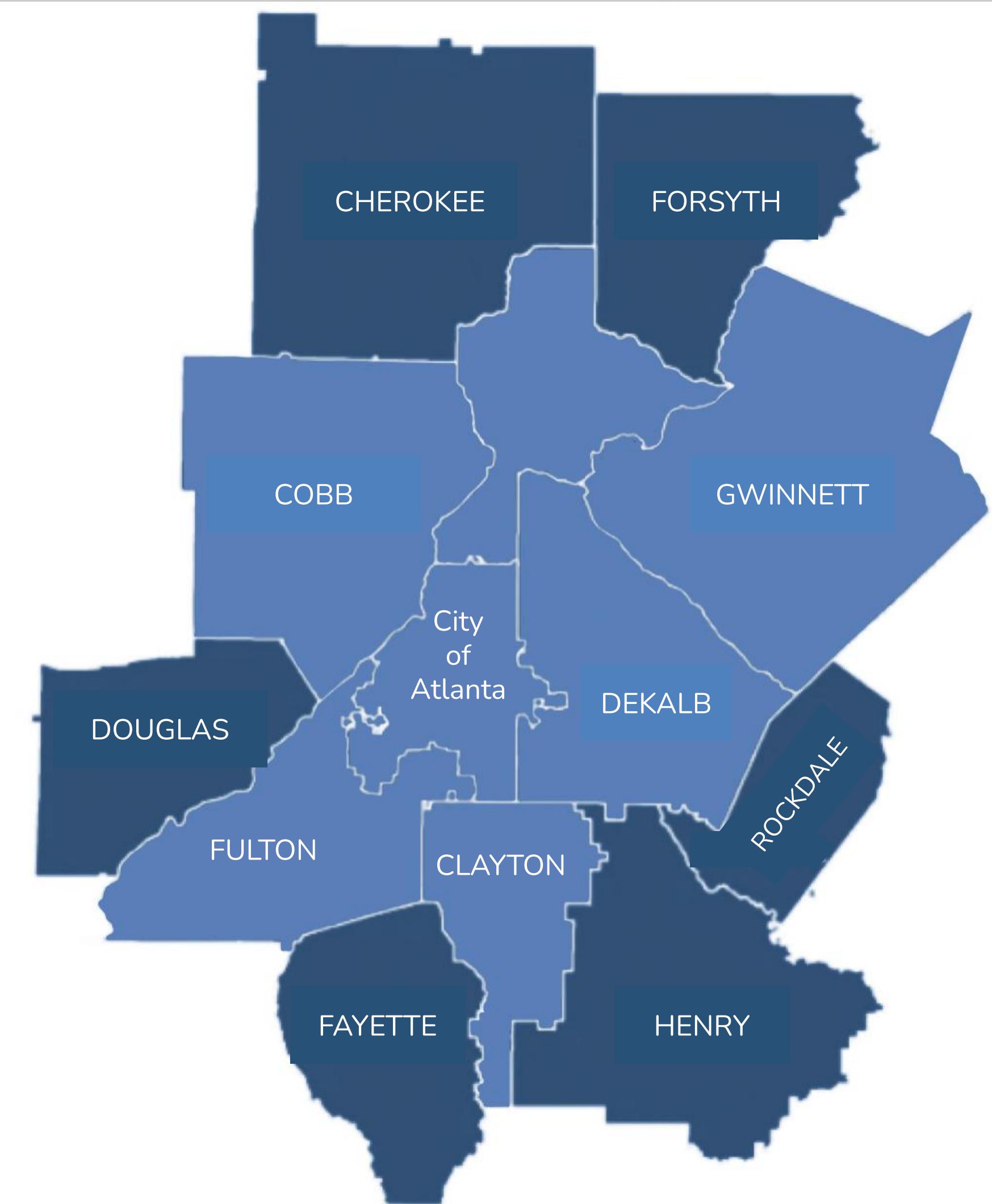
**County Population per US Census**



# What is Metro Atlanta?

Metro 11

Metro 5

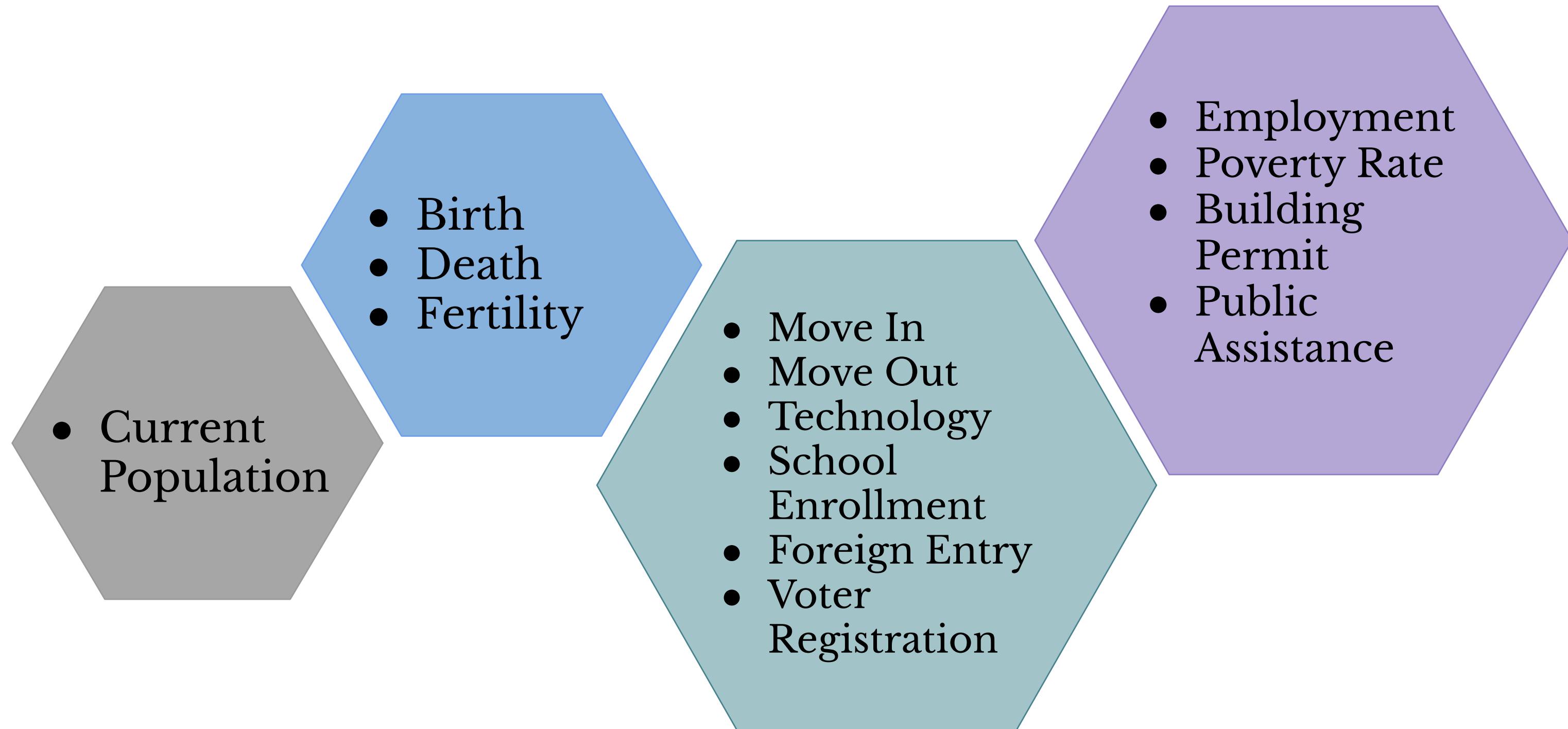


# 03. Collecting Data

---

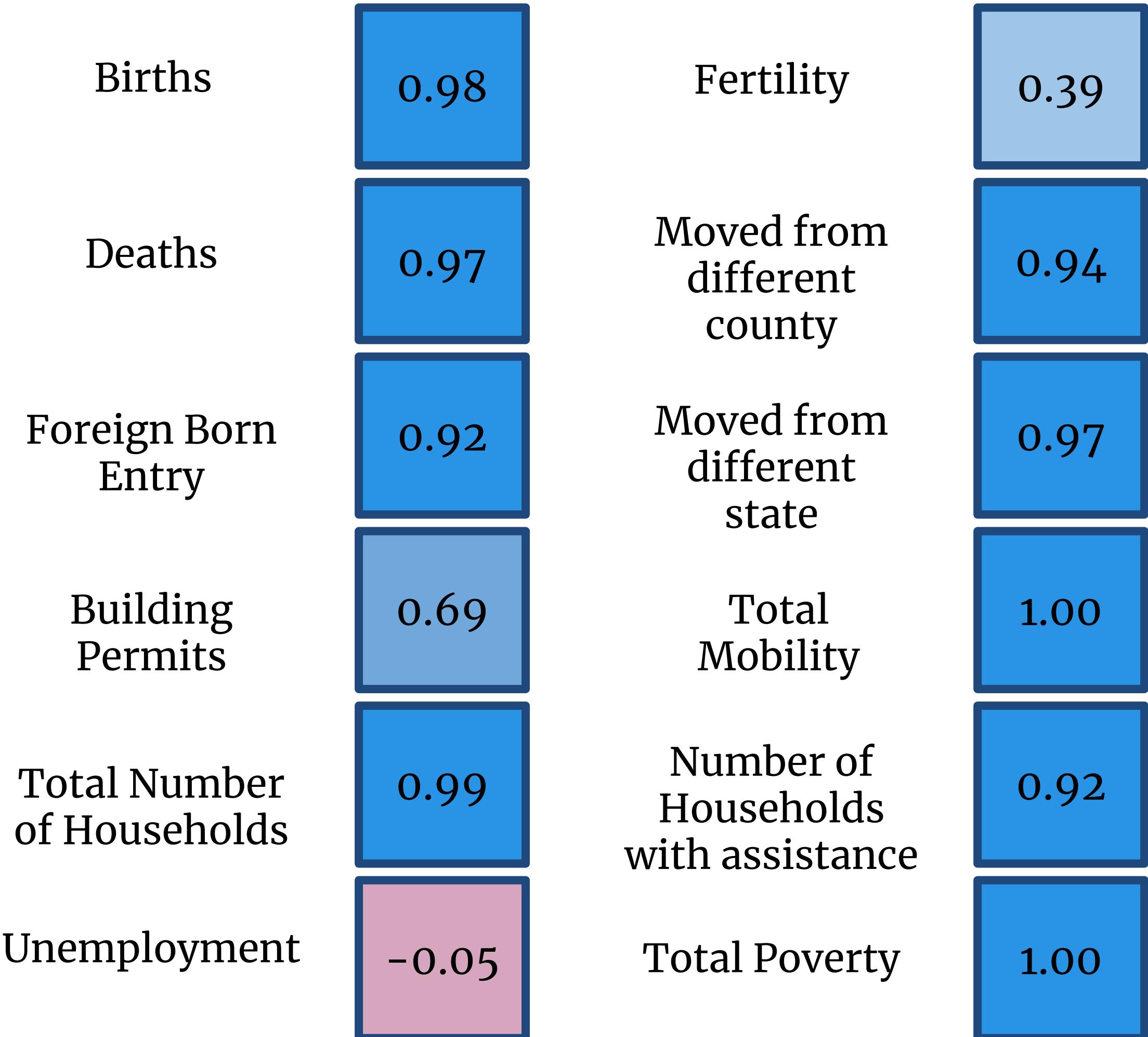
# Variables

Initial (A0) + Natural Change + Migration Change + Economic Growth

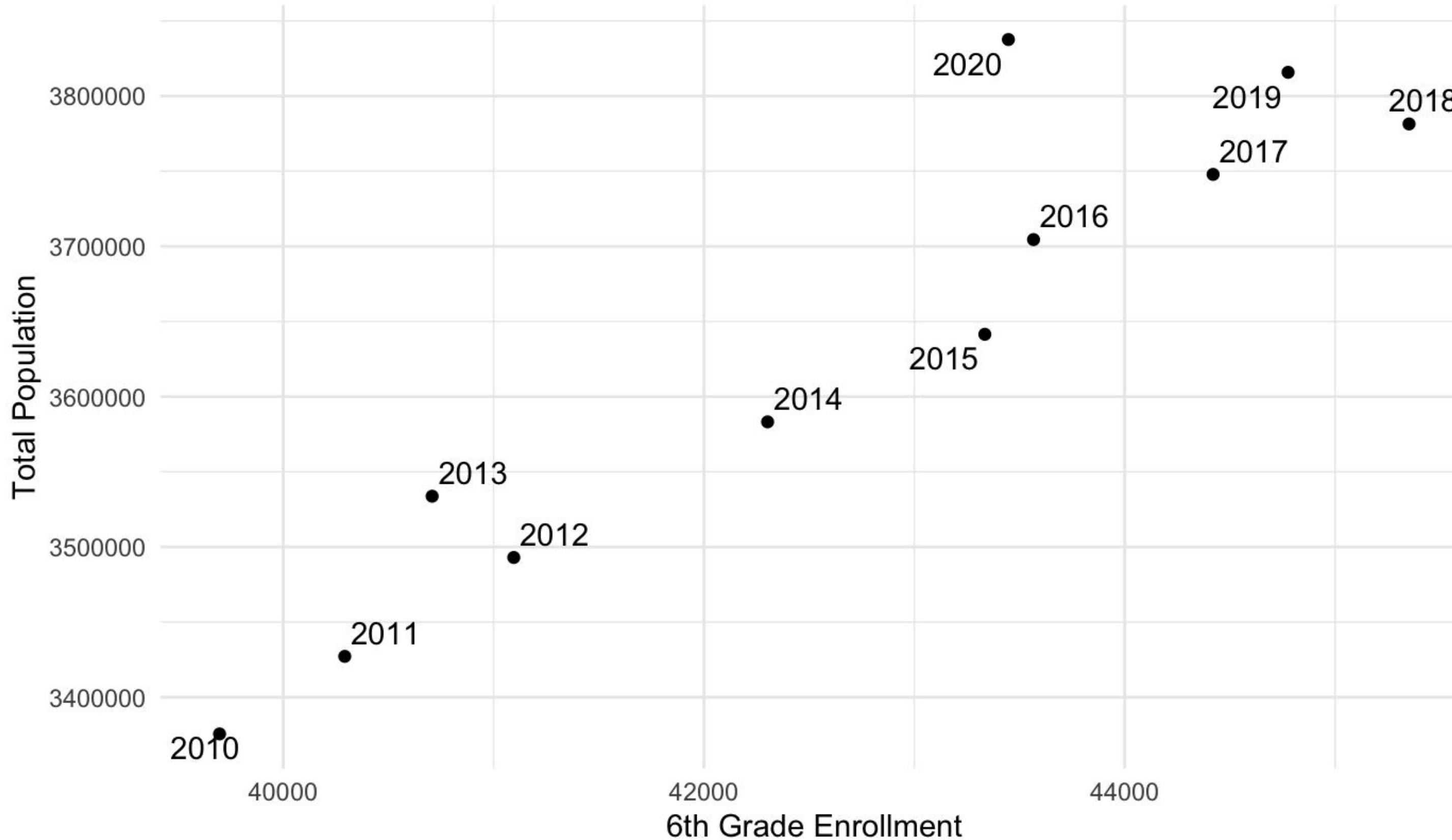


# Correlations of Population with other variables

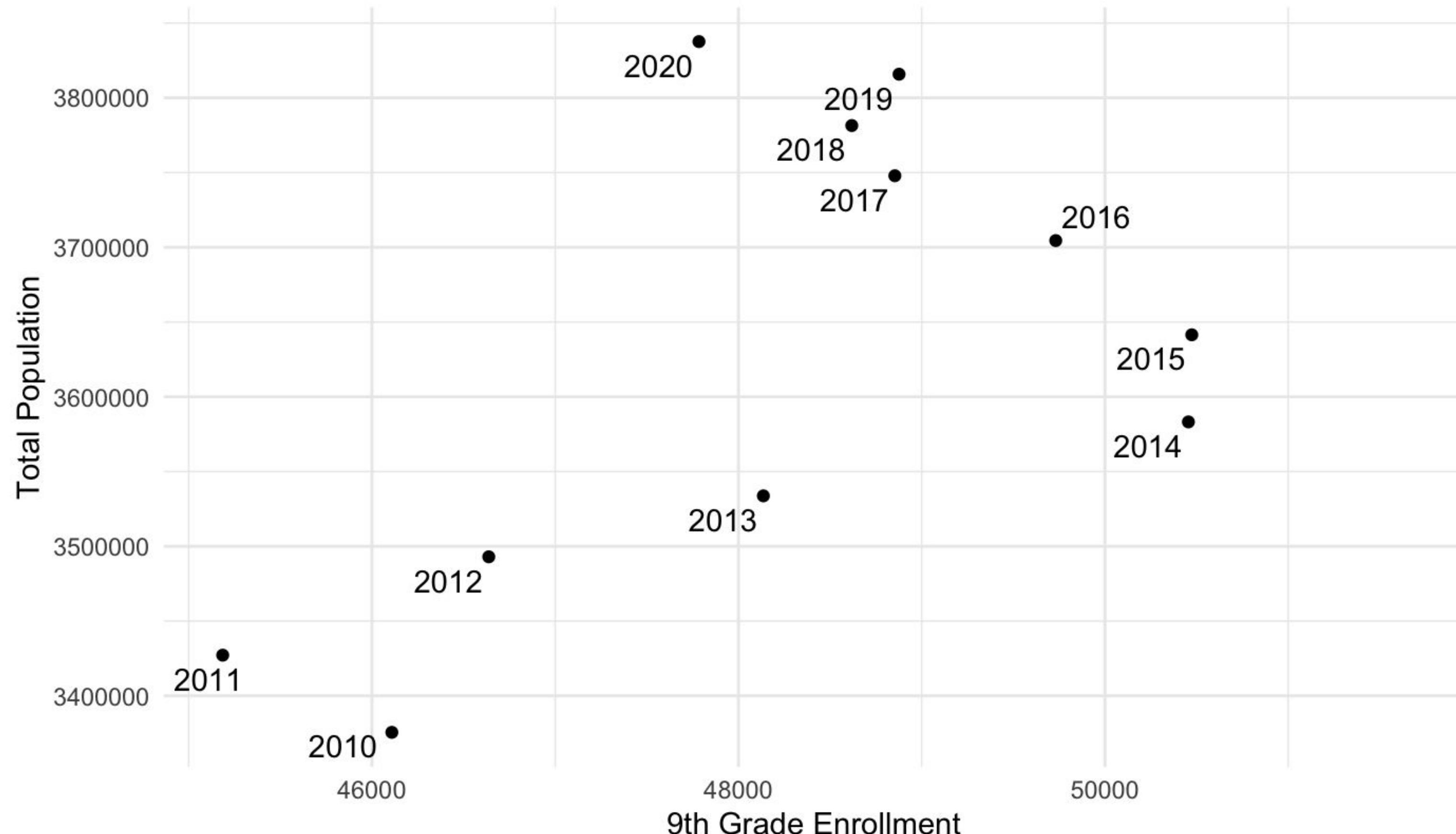
---



# Sixth Grade Enrollment and Total Population of Metro 5

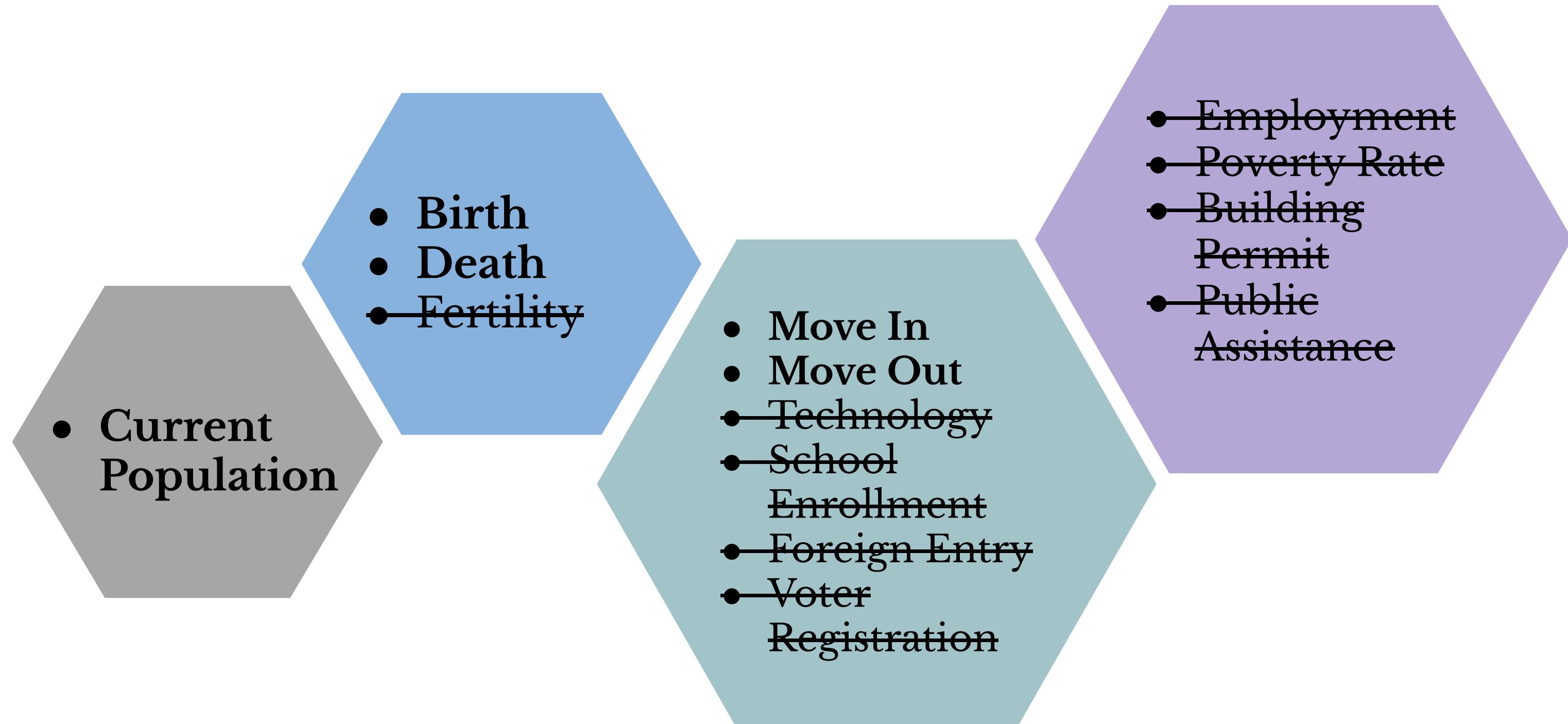


# Ninth Grade Enrollment and Total Population of Metro 5



# Variables

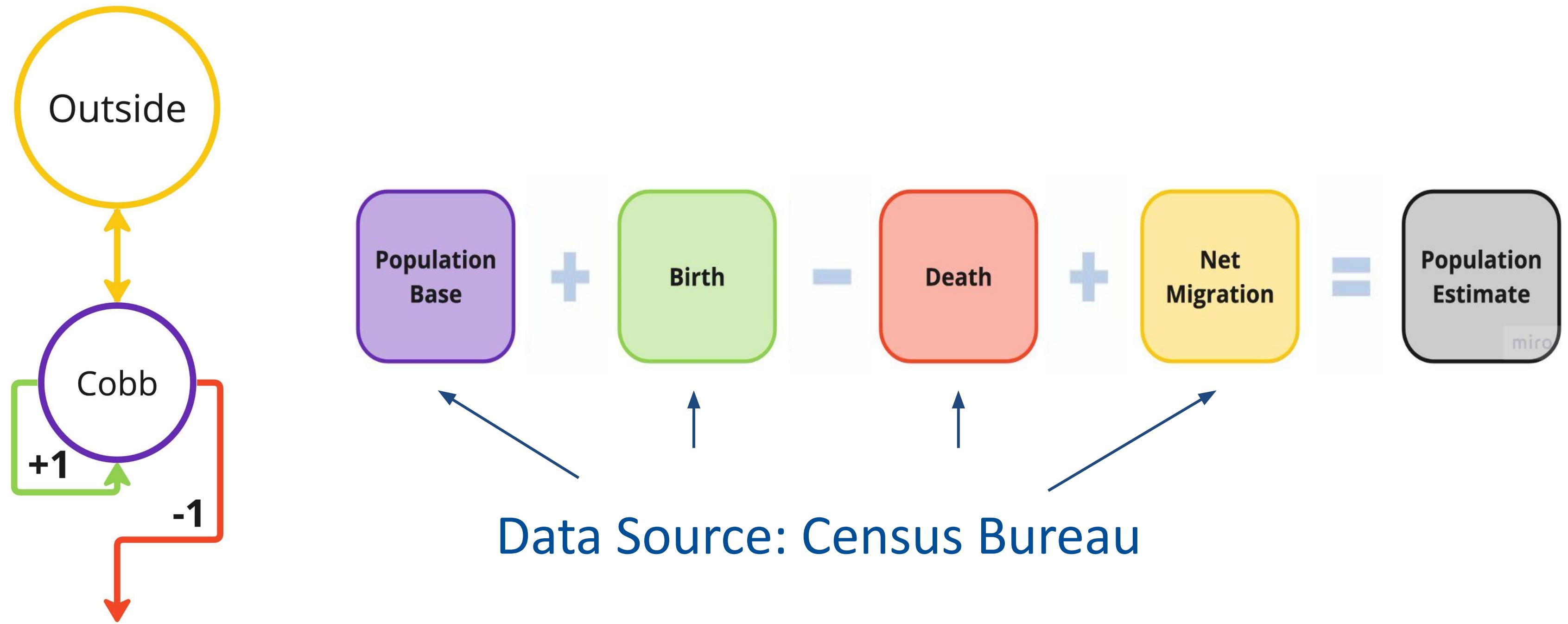
Initial (A0) + Natural Change + Migration Change + Economic Growth

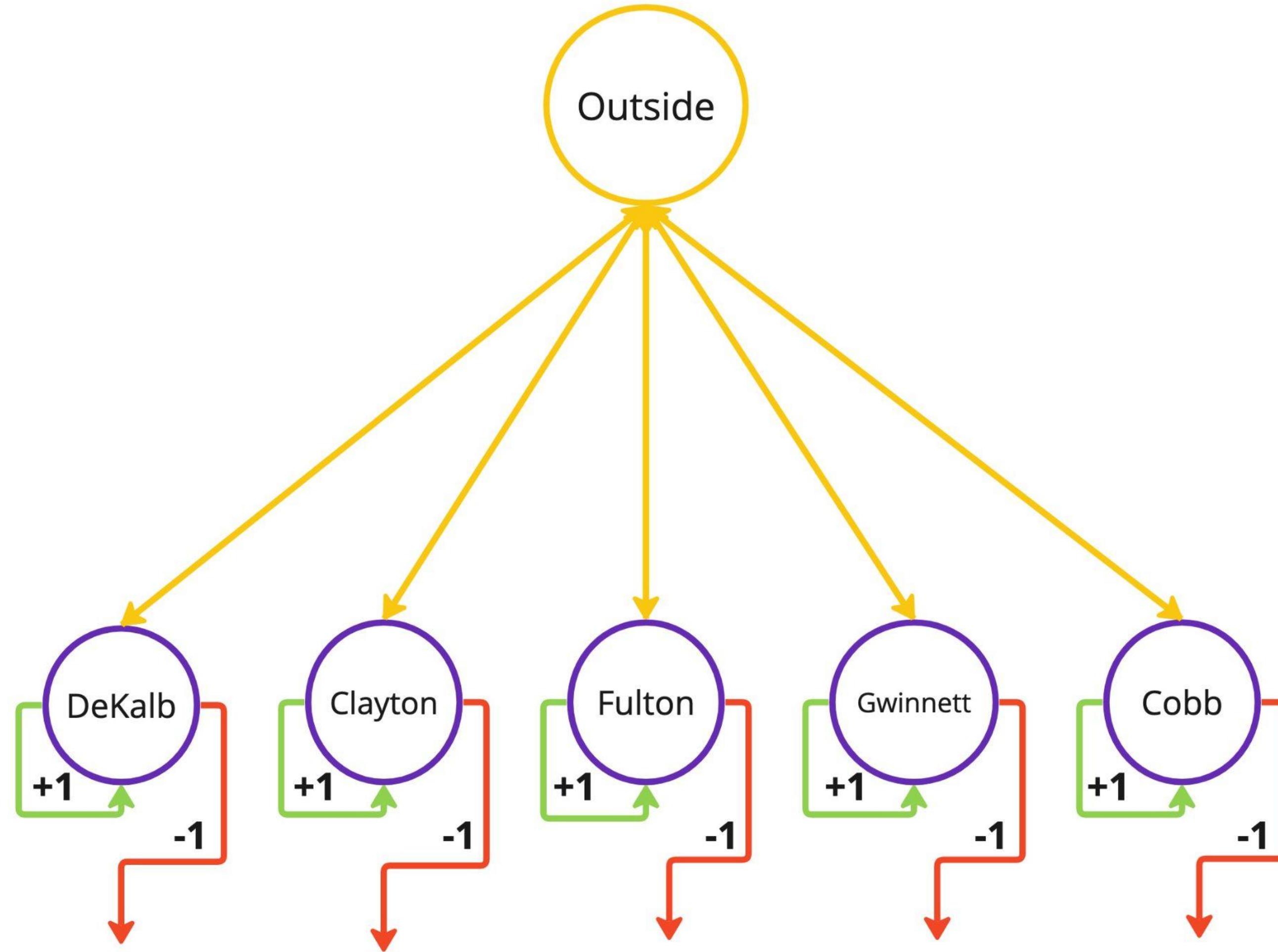


# 04. Building Models

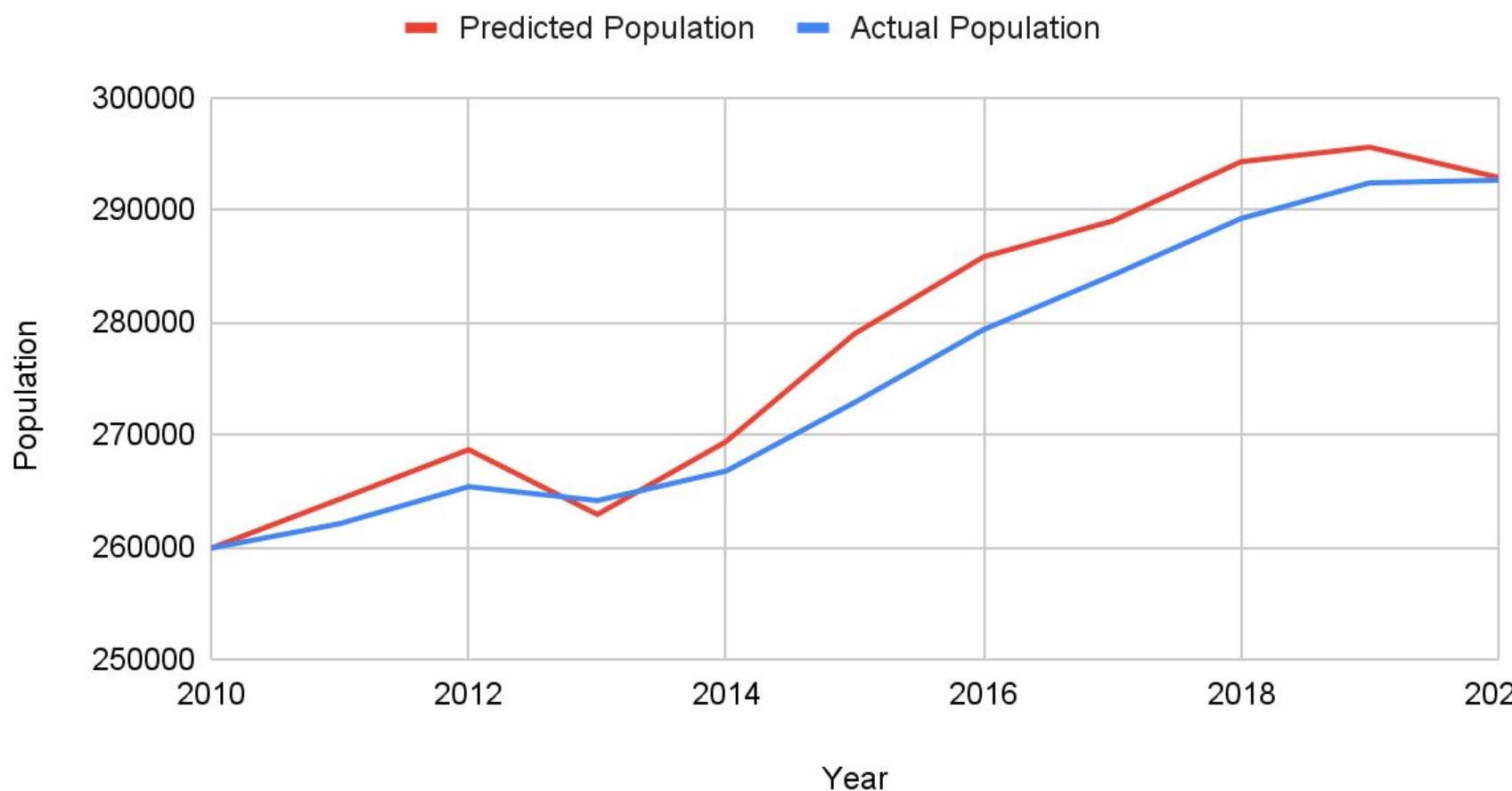
---

# Approaching Population Change

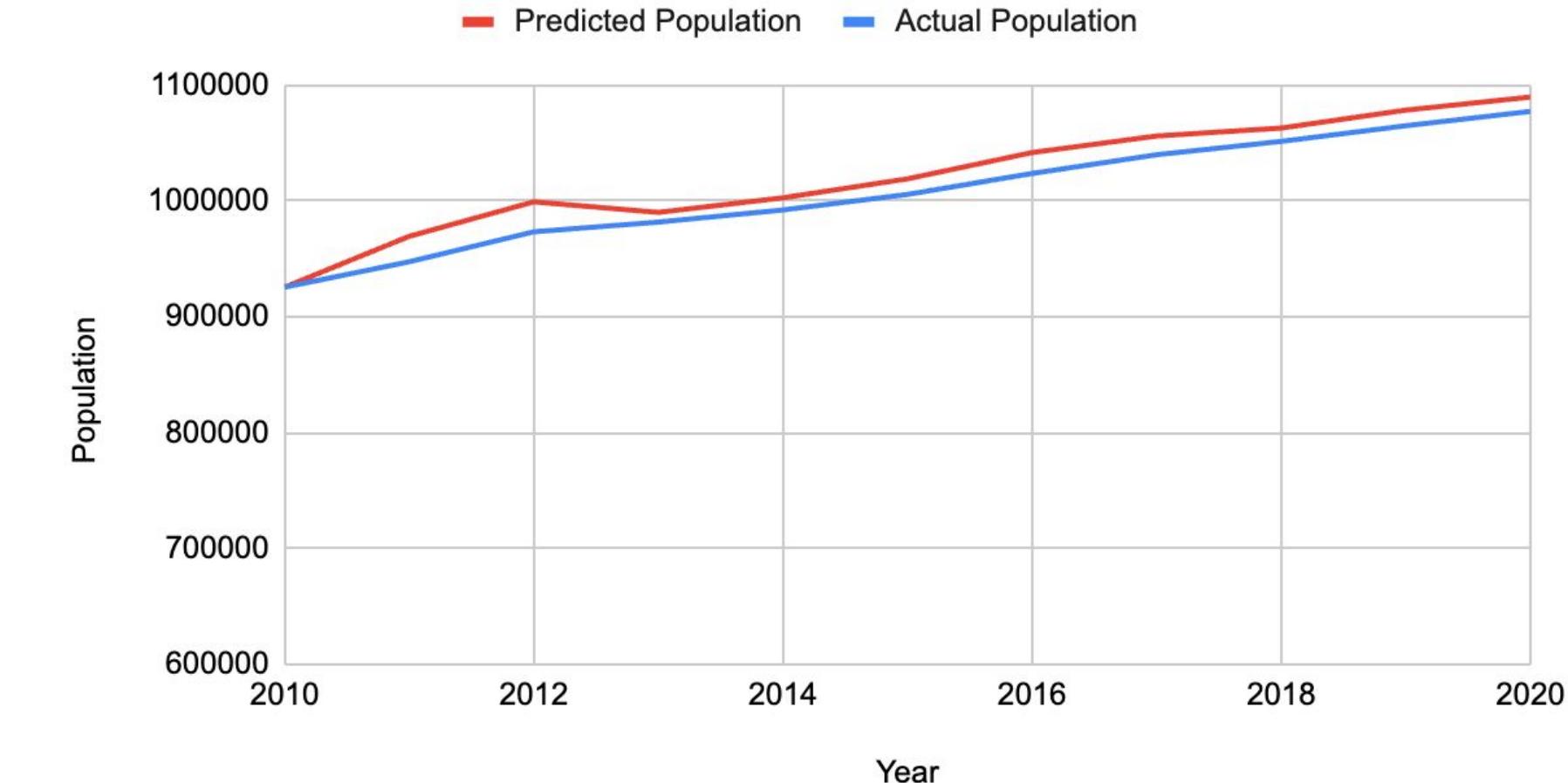




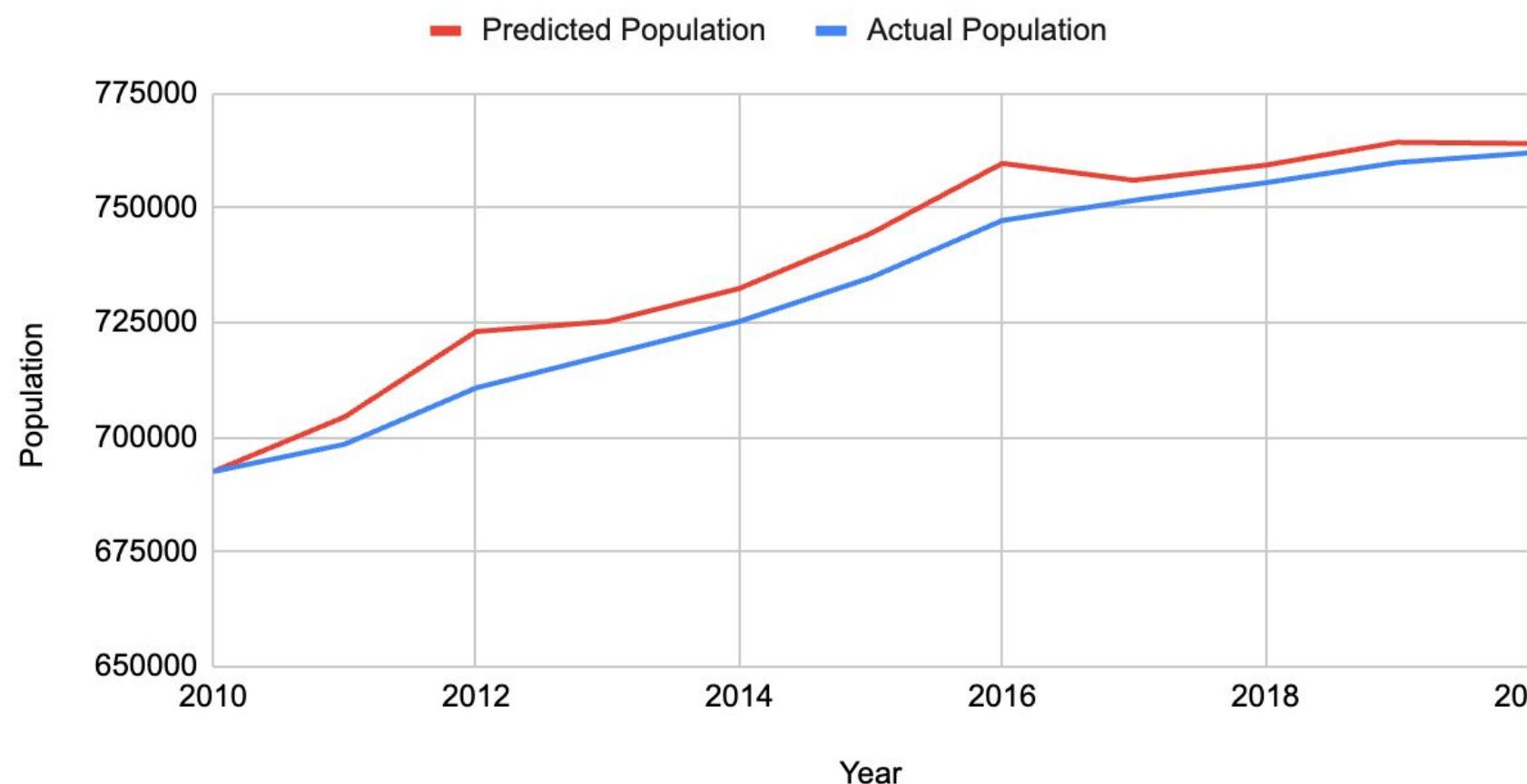
### Predicted Population and Actual Population of Clayton County



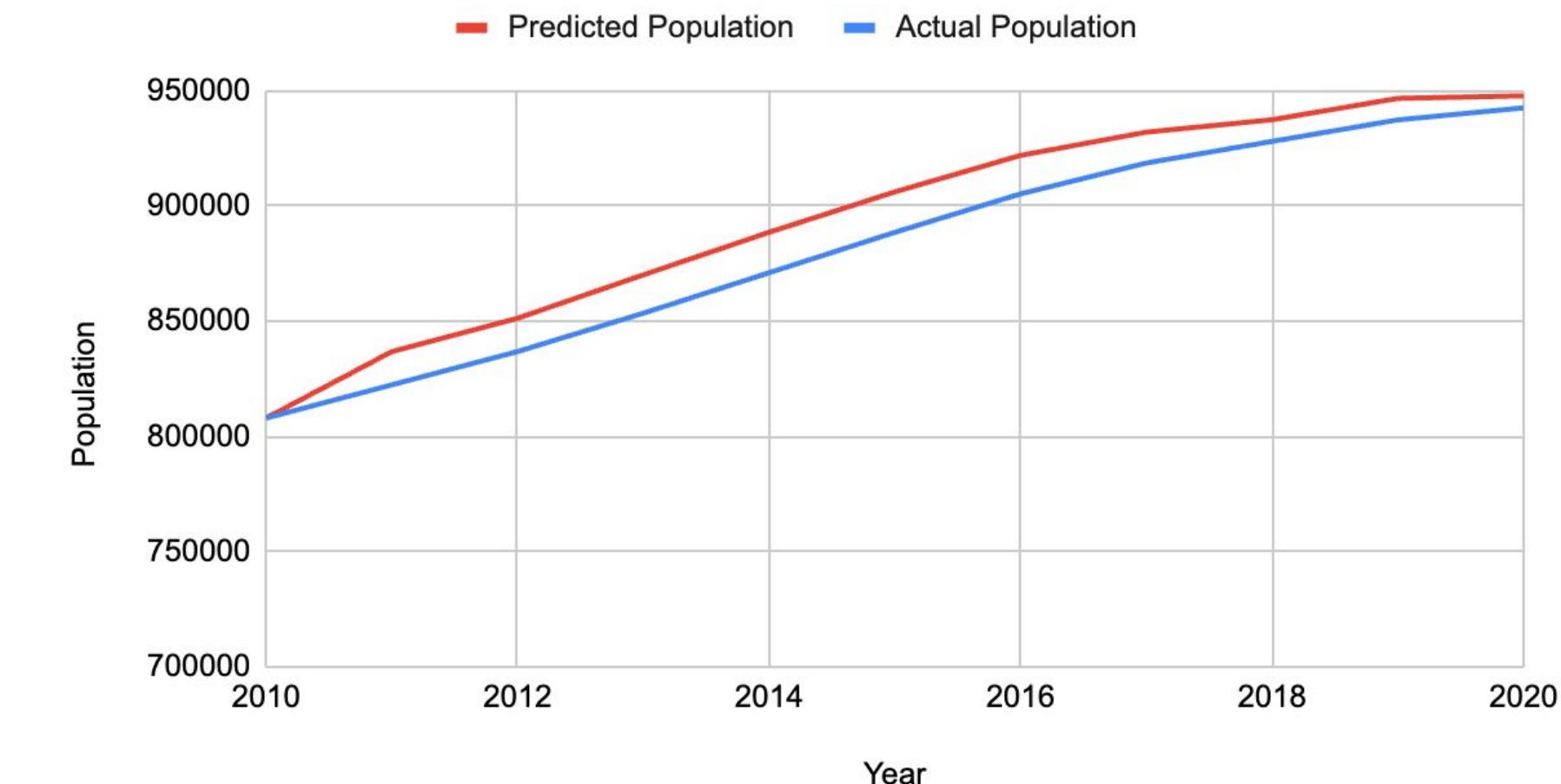
### Predicted Population and Actual Population of Fulton County



### Predicted Population and Actual Population of DeKalb County

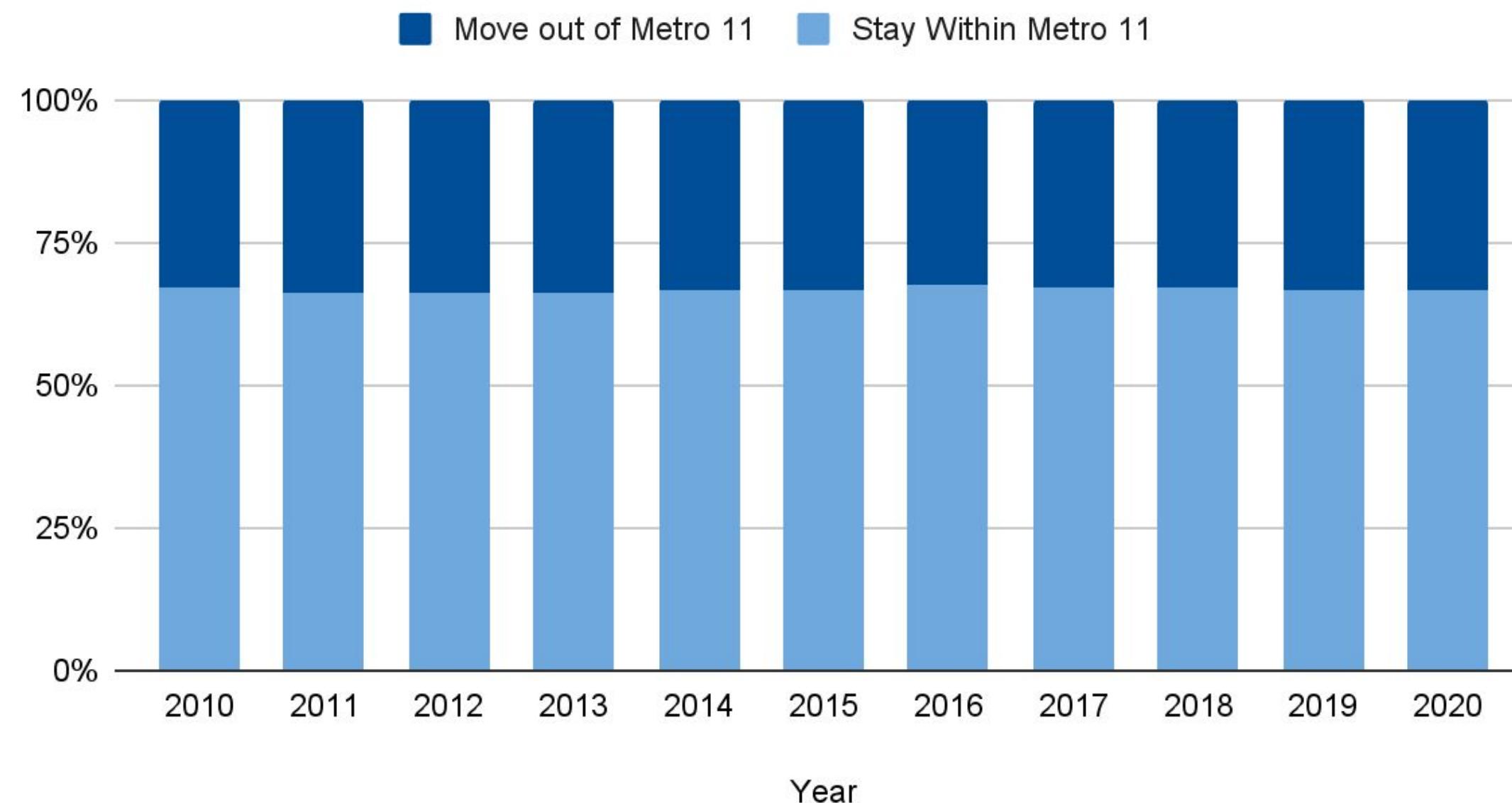


### Predicted Population and Actual Population of Gwinnett County

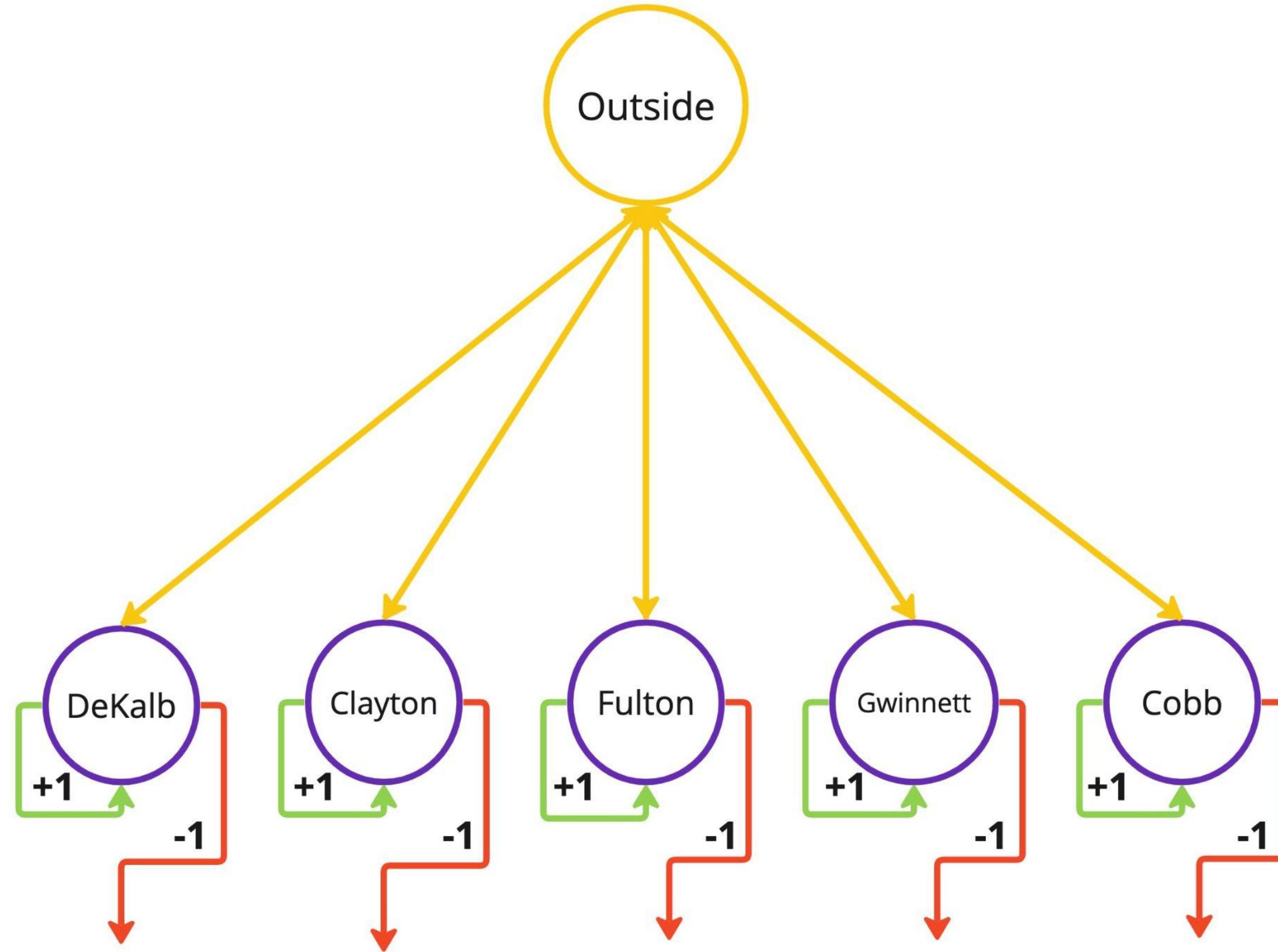


# Where are People Migrating?

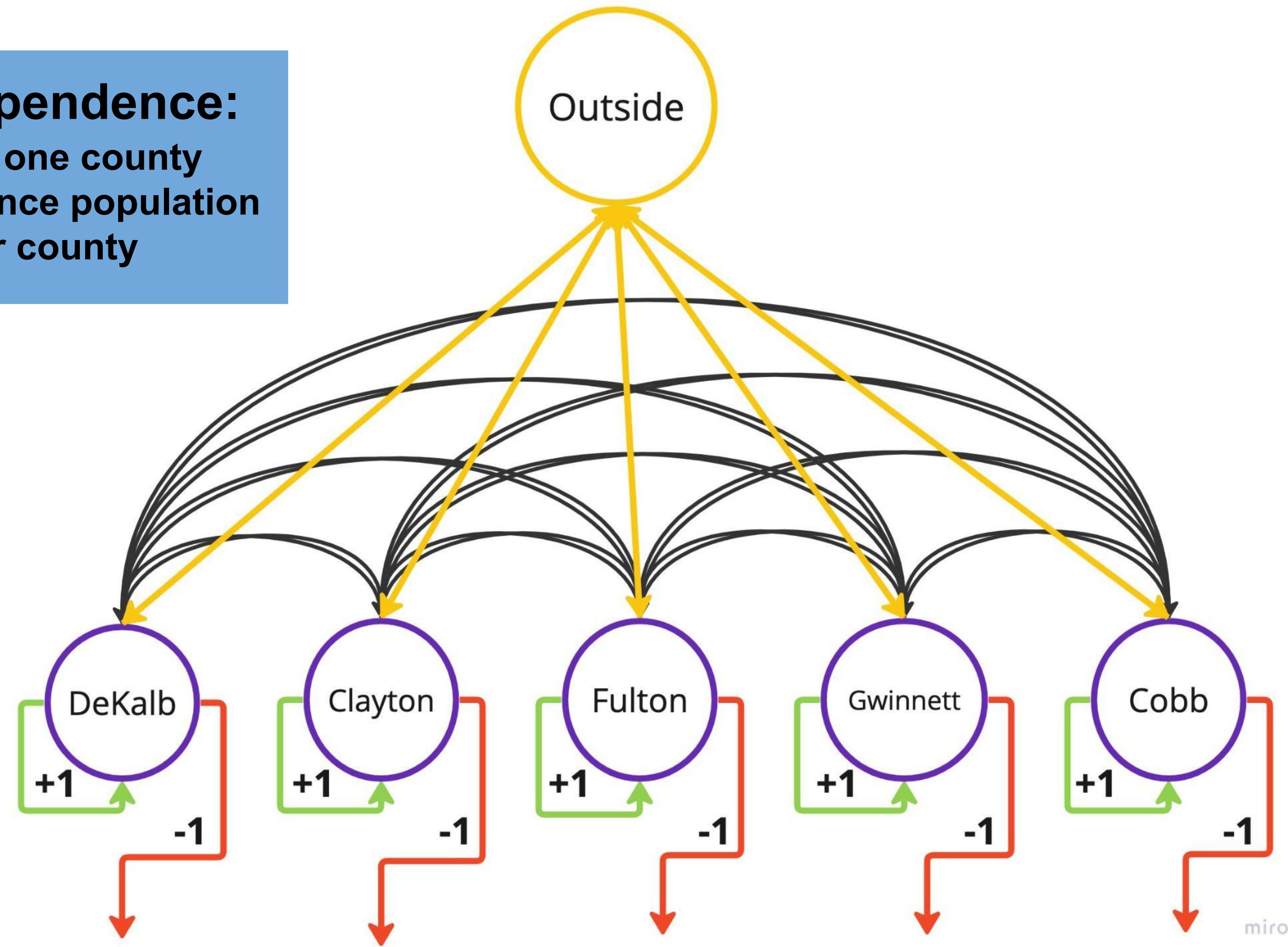
Patterns of Metro 11 Counties' Migration



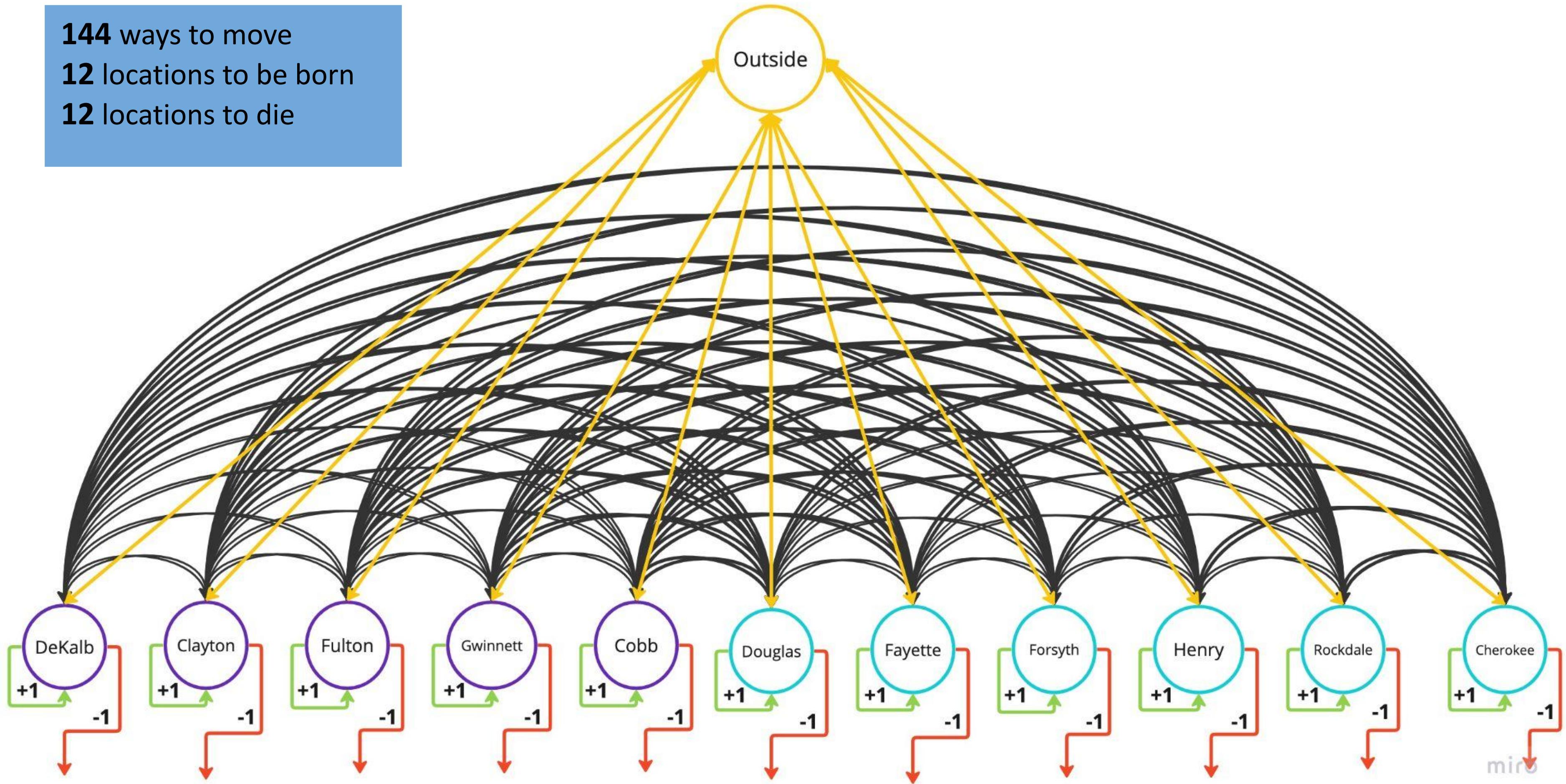
**2/3 of those who move stay **within** Metro 11 Area**

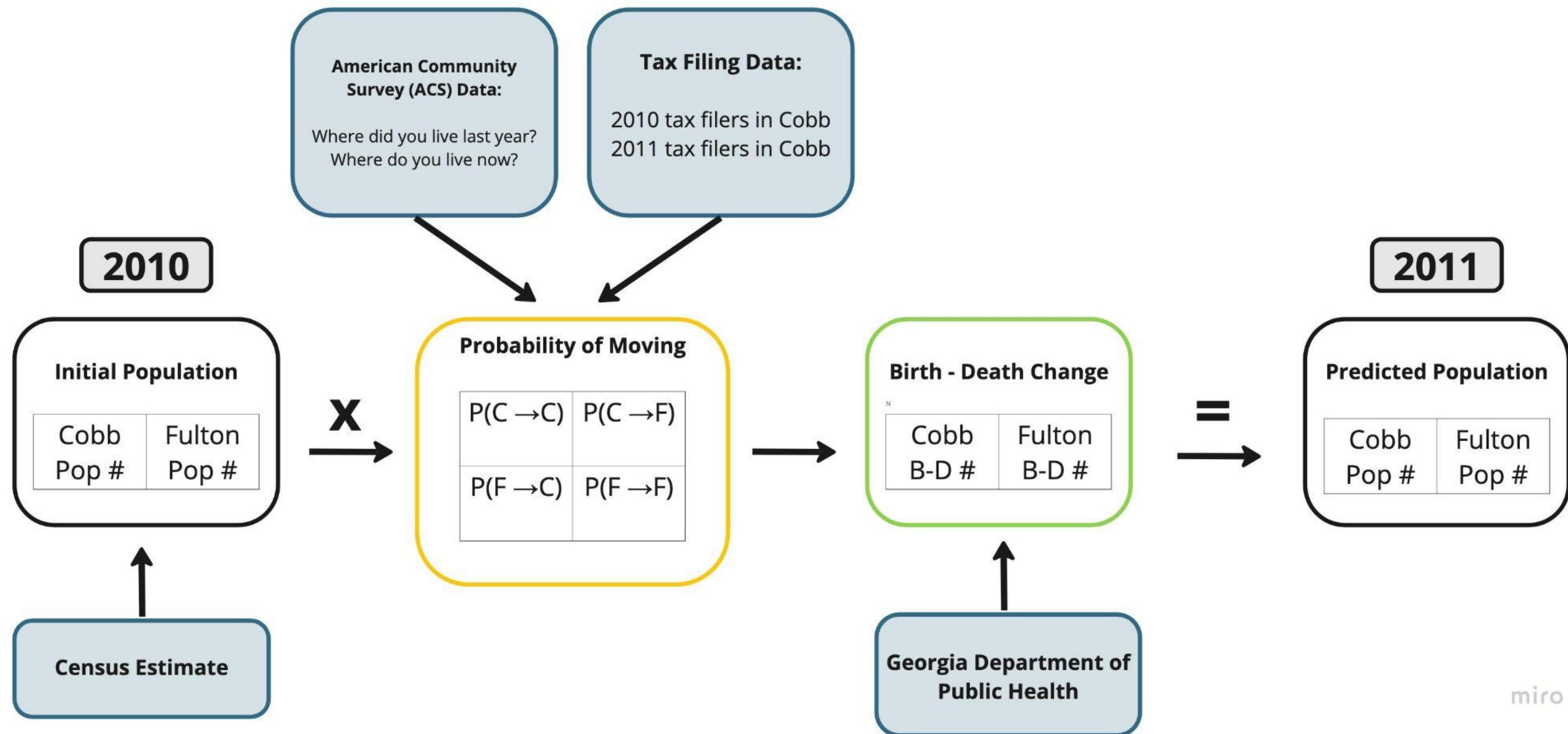


**Interdependence:**  
growth in one county  
will influence population  
in another county

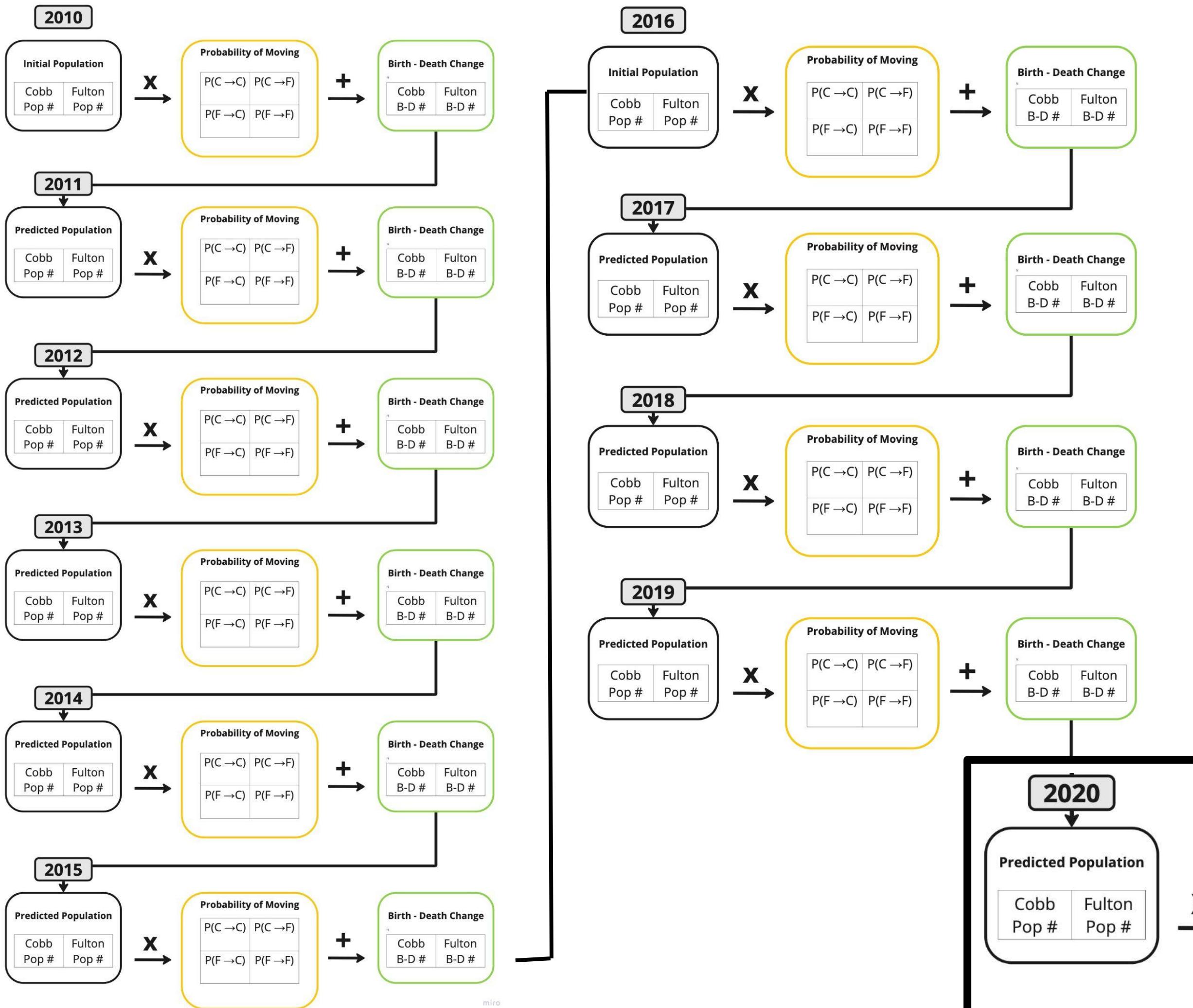


**144 ways to move**  
**12 locations to be born**  
**12 locations to die**





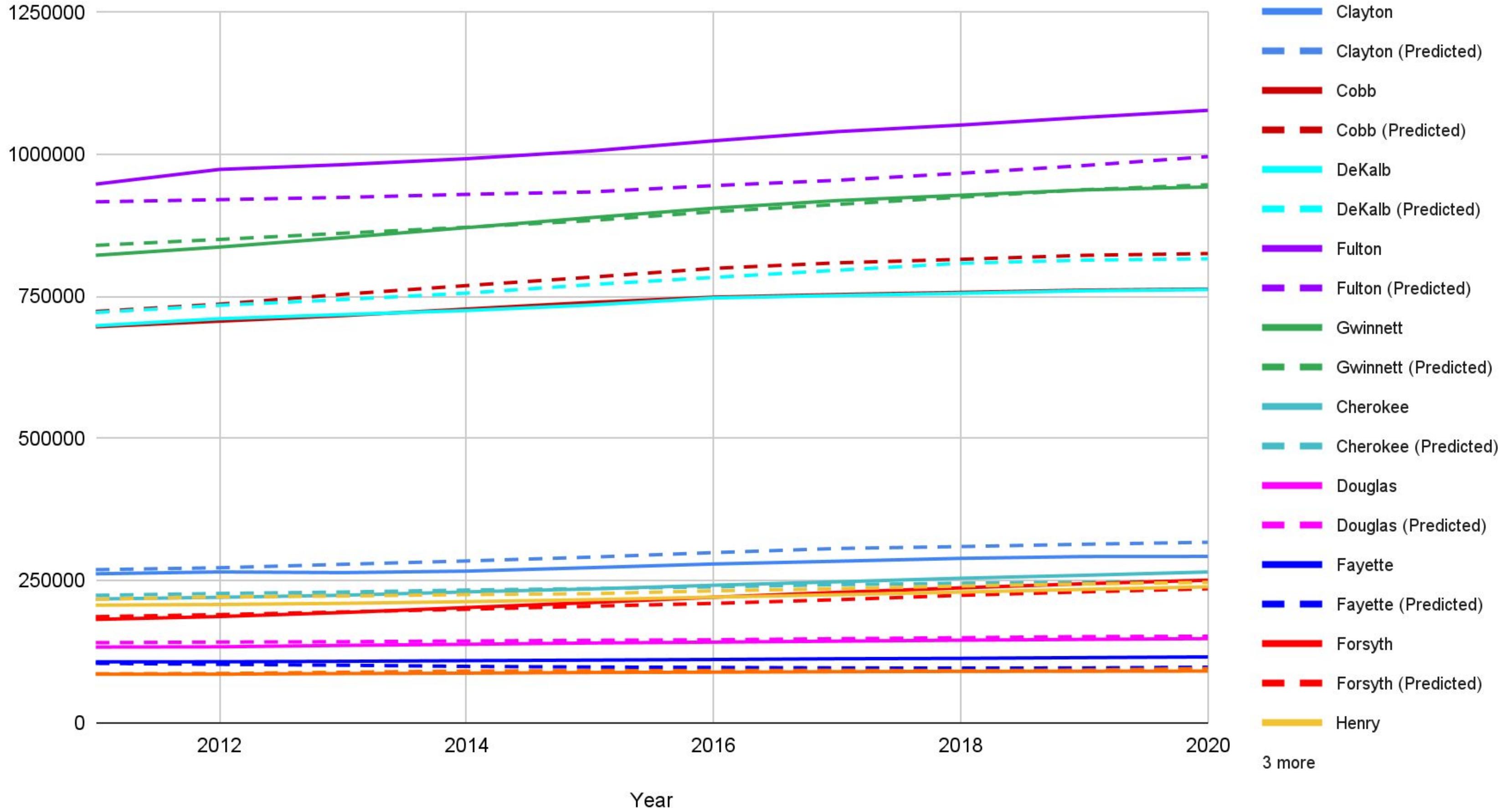
# Compound Growth!



# 05. Results

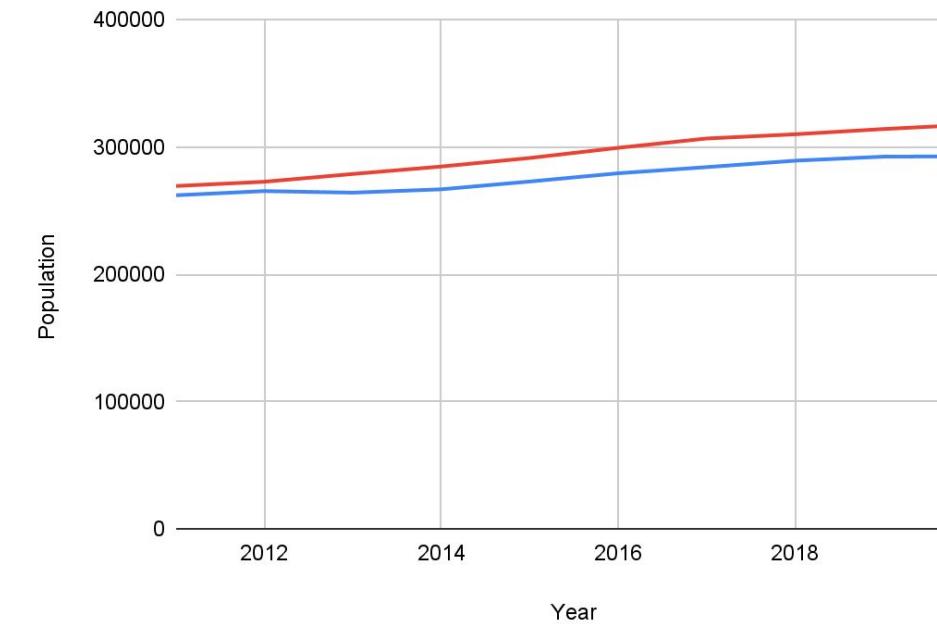
---

# ATL Metro-11 ACS Population Predictions Compared to Census' Predictions

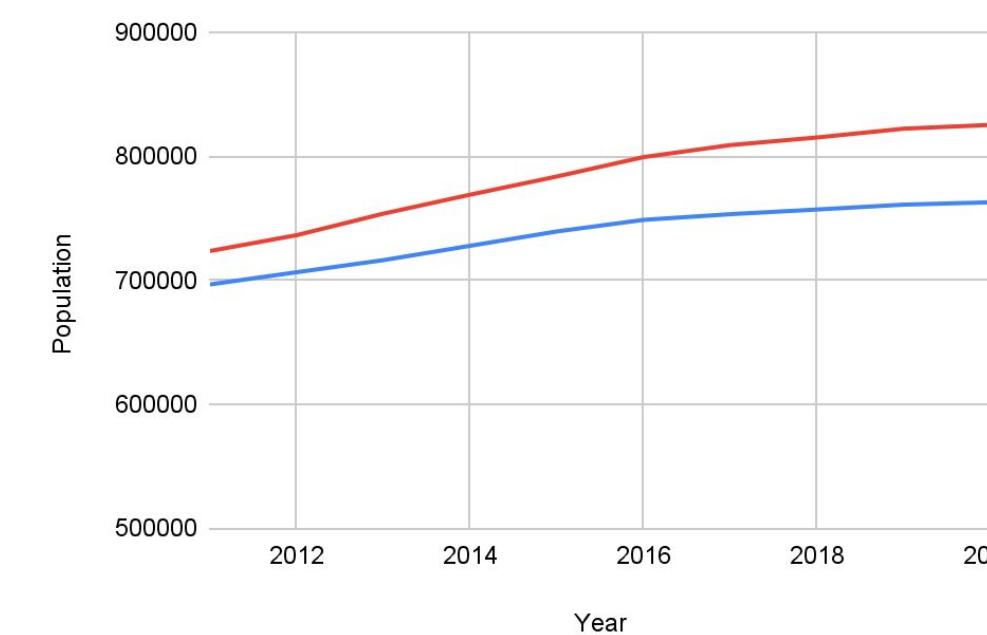


# Population vs. Predicted Population of Metro-5 (ACS Data)

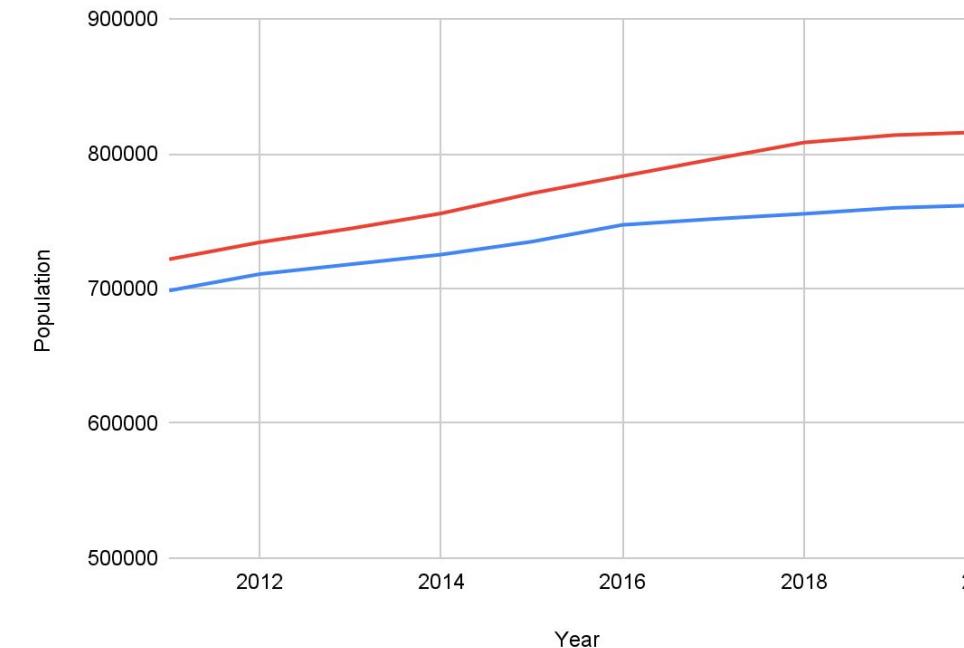
Population by Year of Clayton



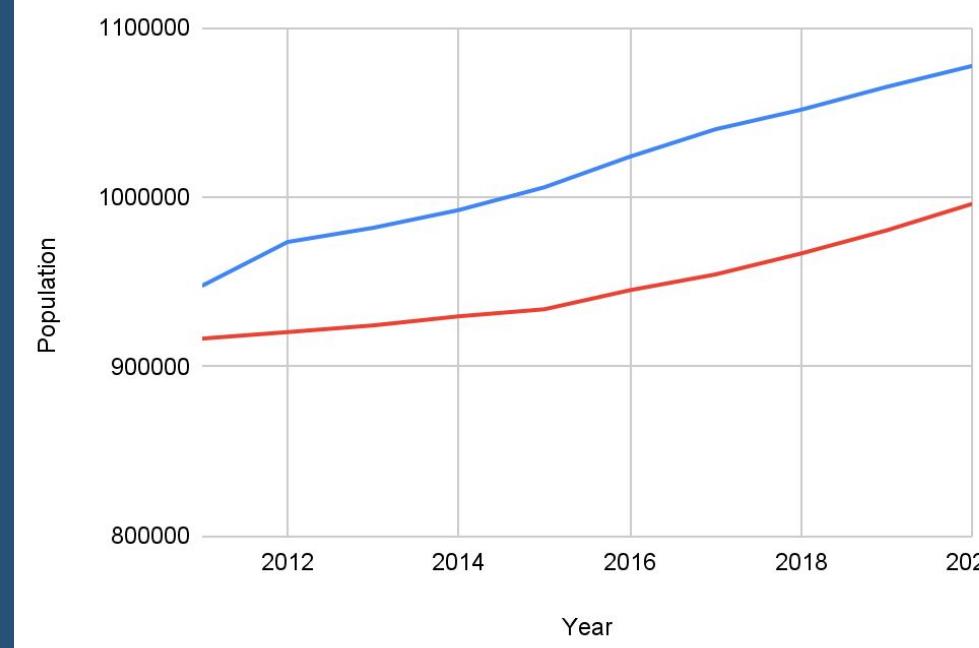
Population by Year of Cobb



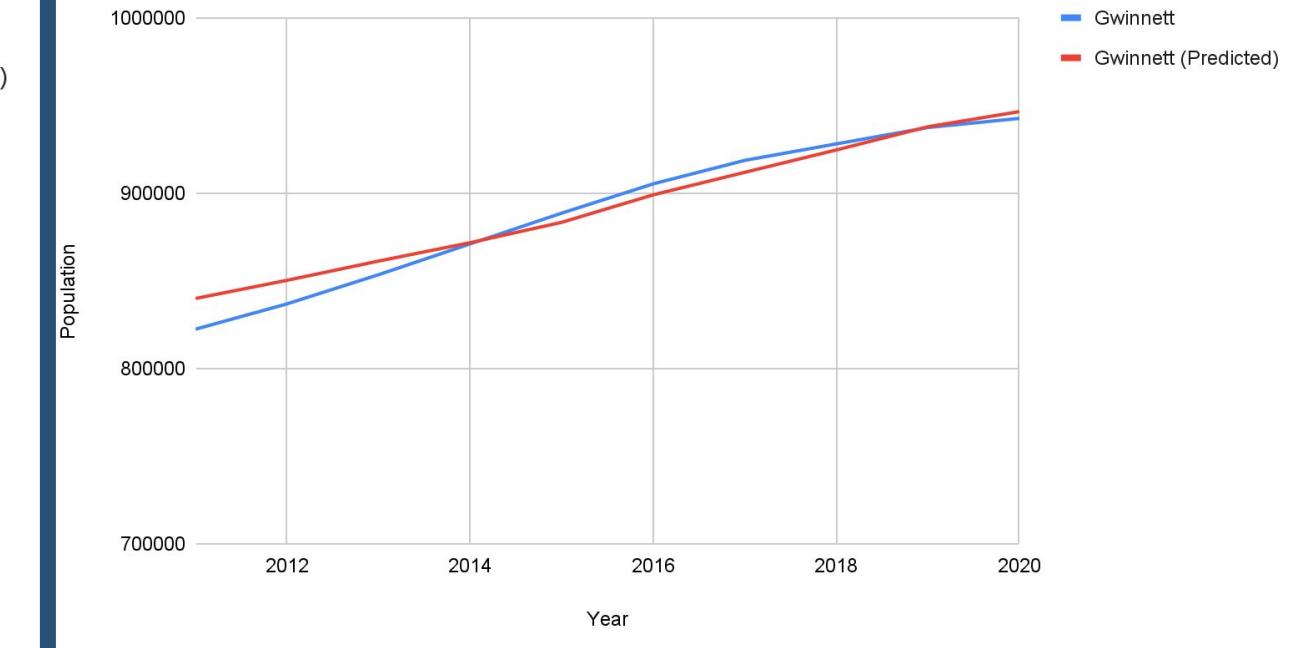
Population by Year of DeKalb



Population by Year of Fulton

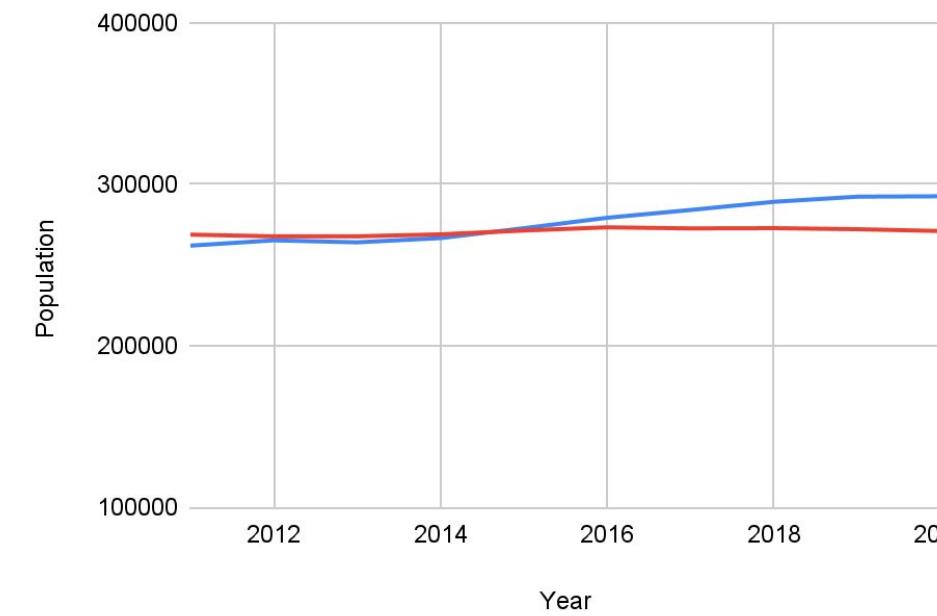


Population by Year of Gwinnett

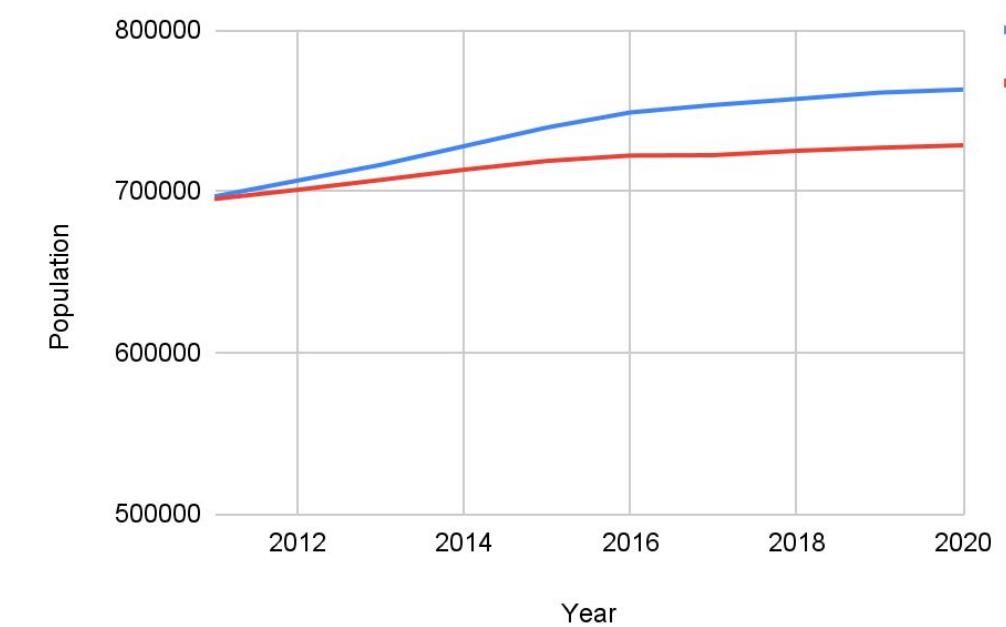


# Population vs. Predicted Population of Metro-5 (Tax Data)

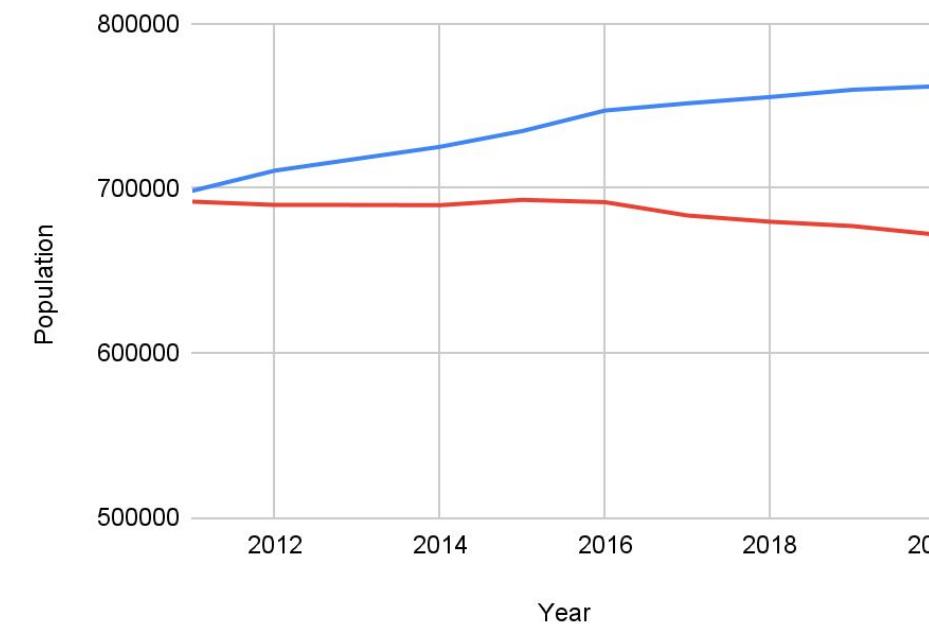
Population by Year of Clayton



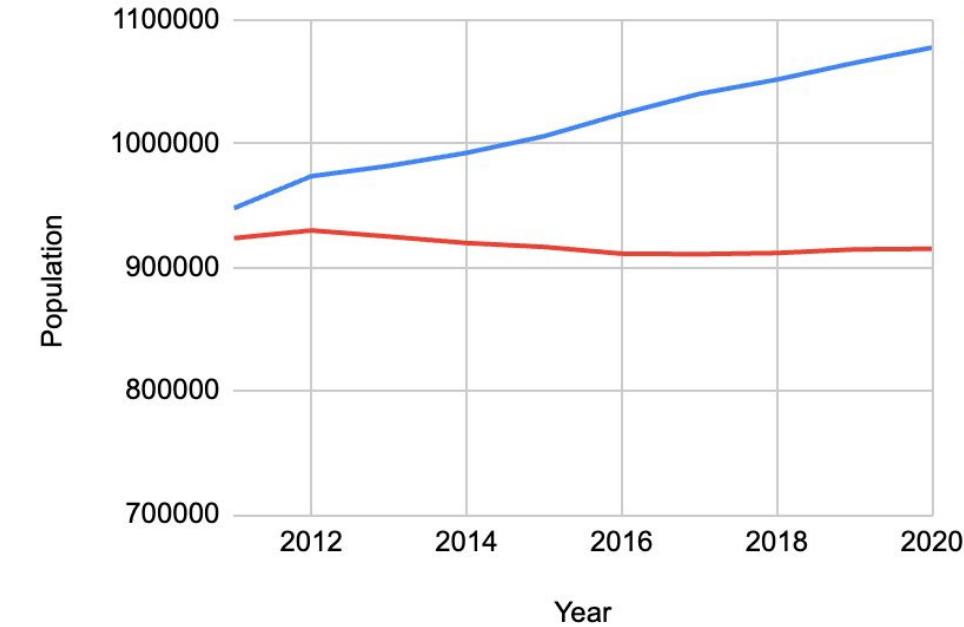
Population by Year of Cobb



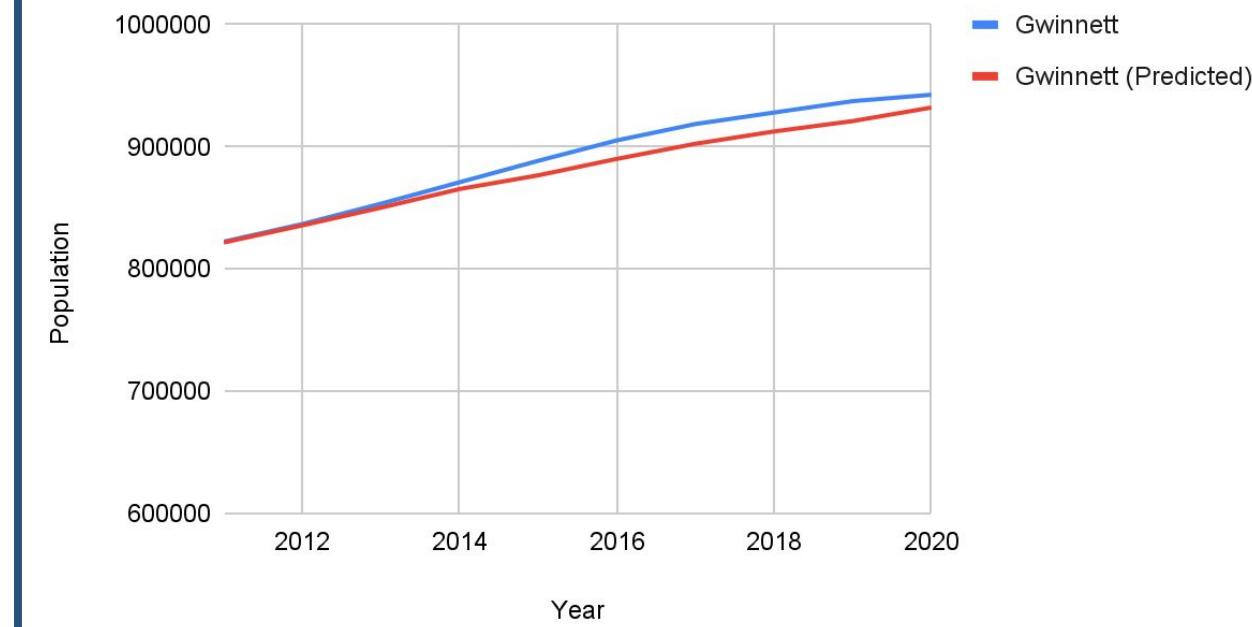
Population by Year of DeKalb



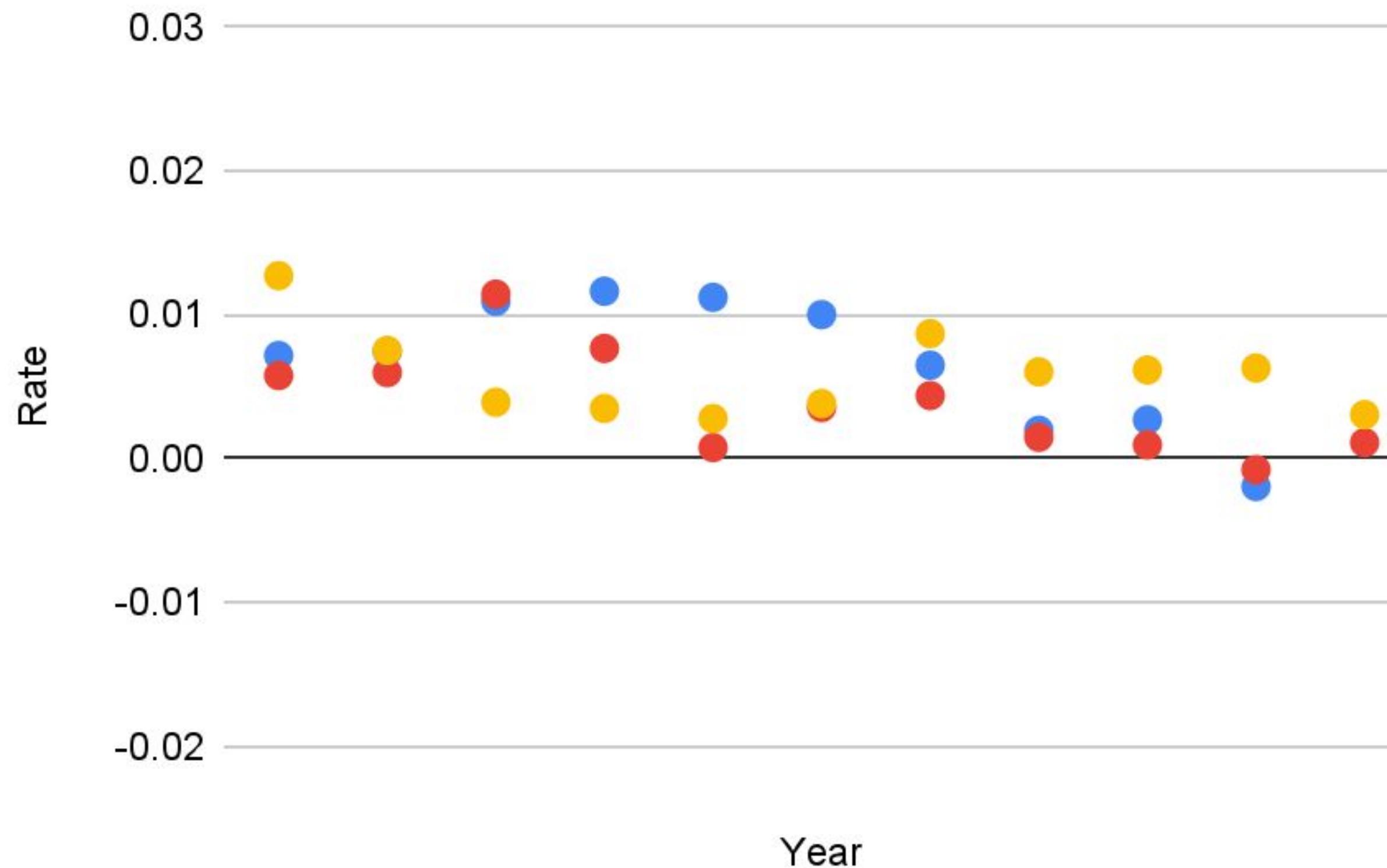
Population by Year of Fulton



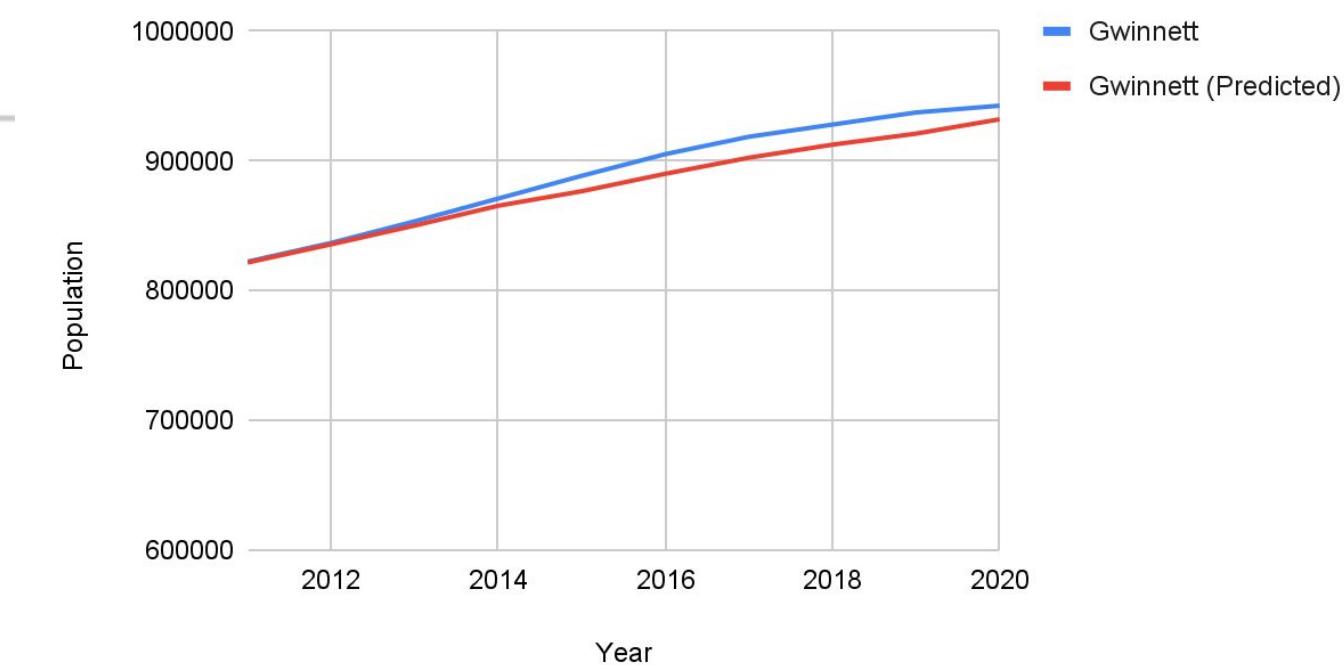
Population by Year of Gwinnett



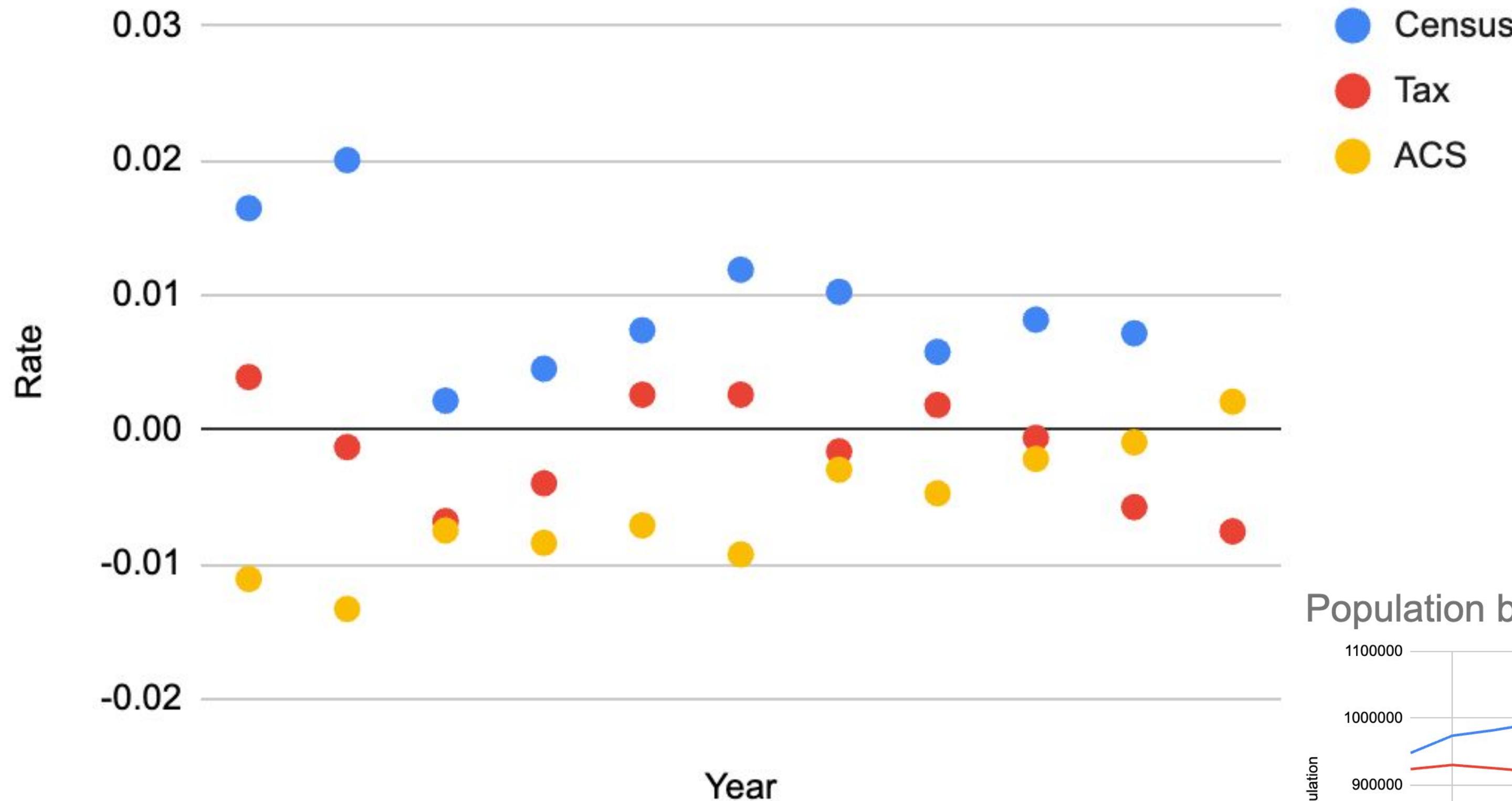
# Rate of People Moving into Gwinnett



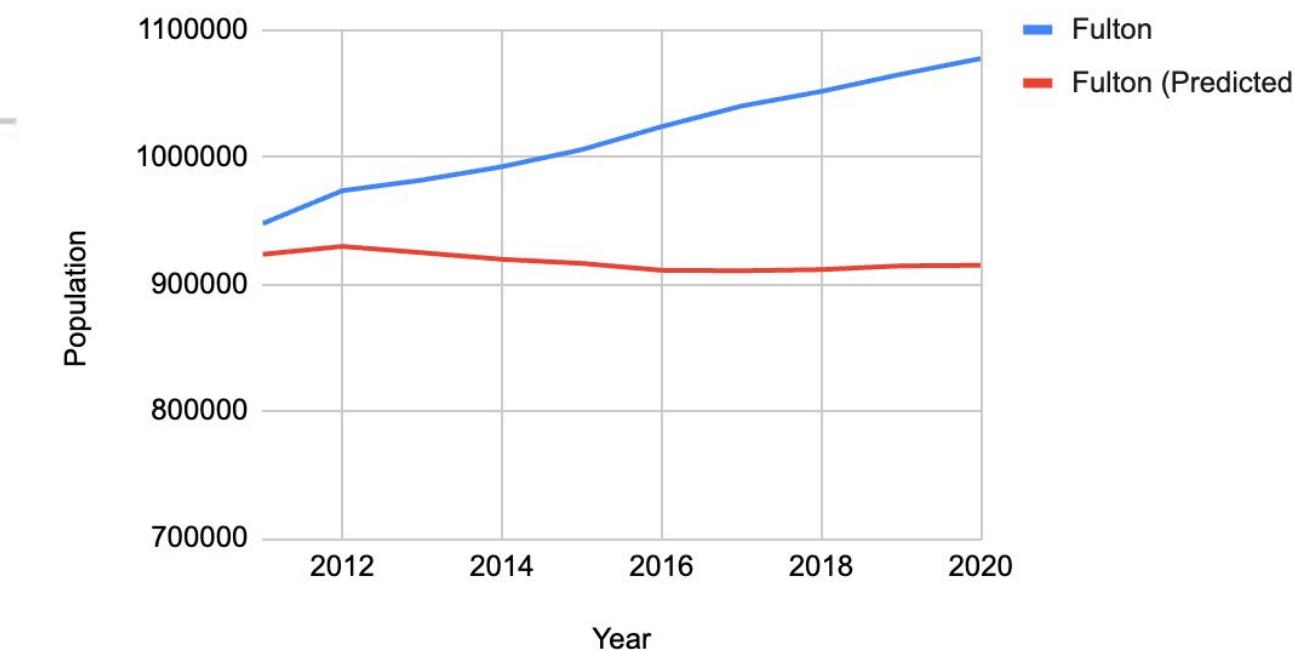
Population by Year of Gwinnett



# Rate of People Moving into Fulton



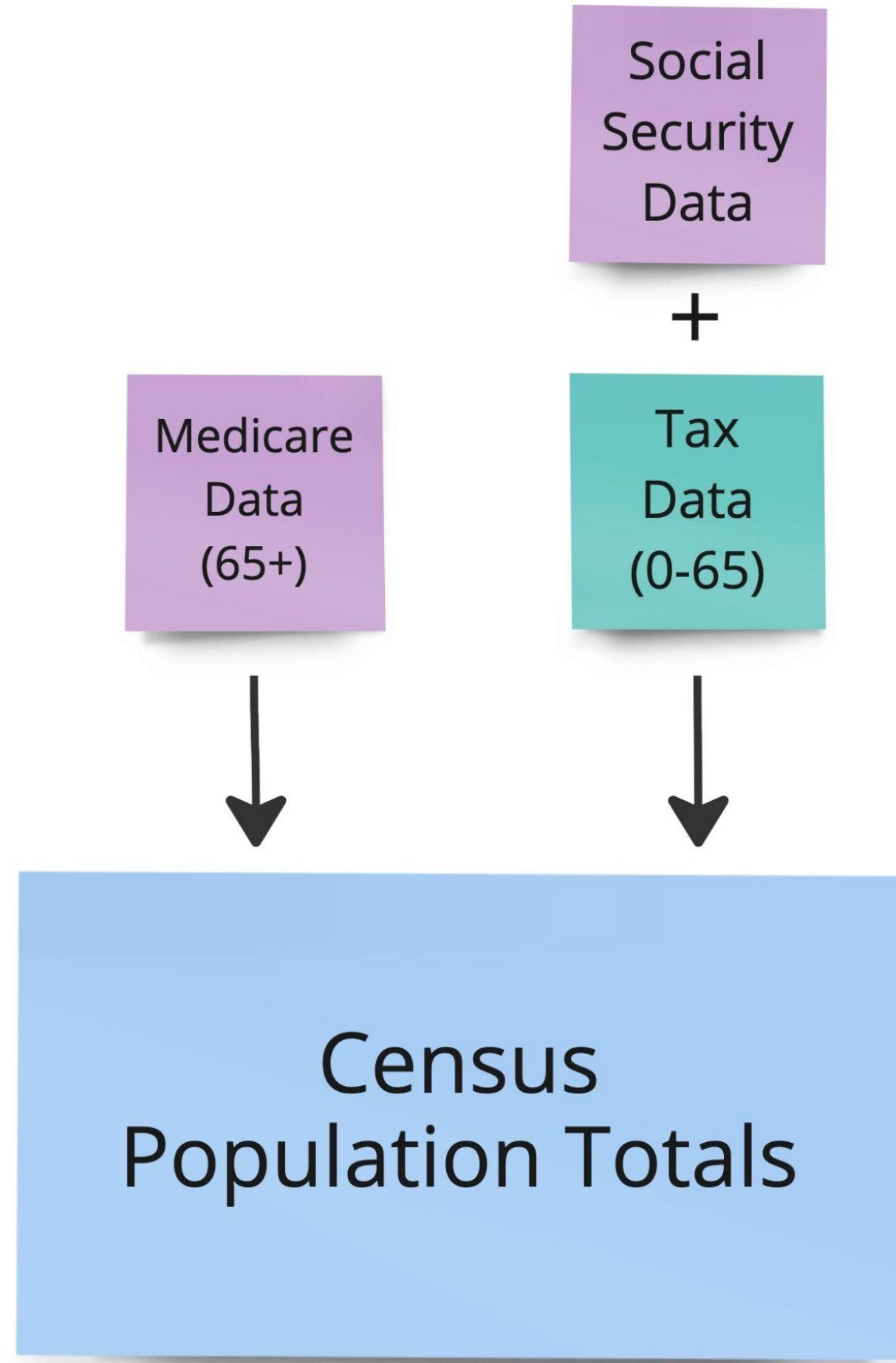
## Population by Year of Fulton





It does not make...  
*cens to us*

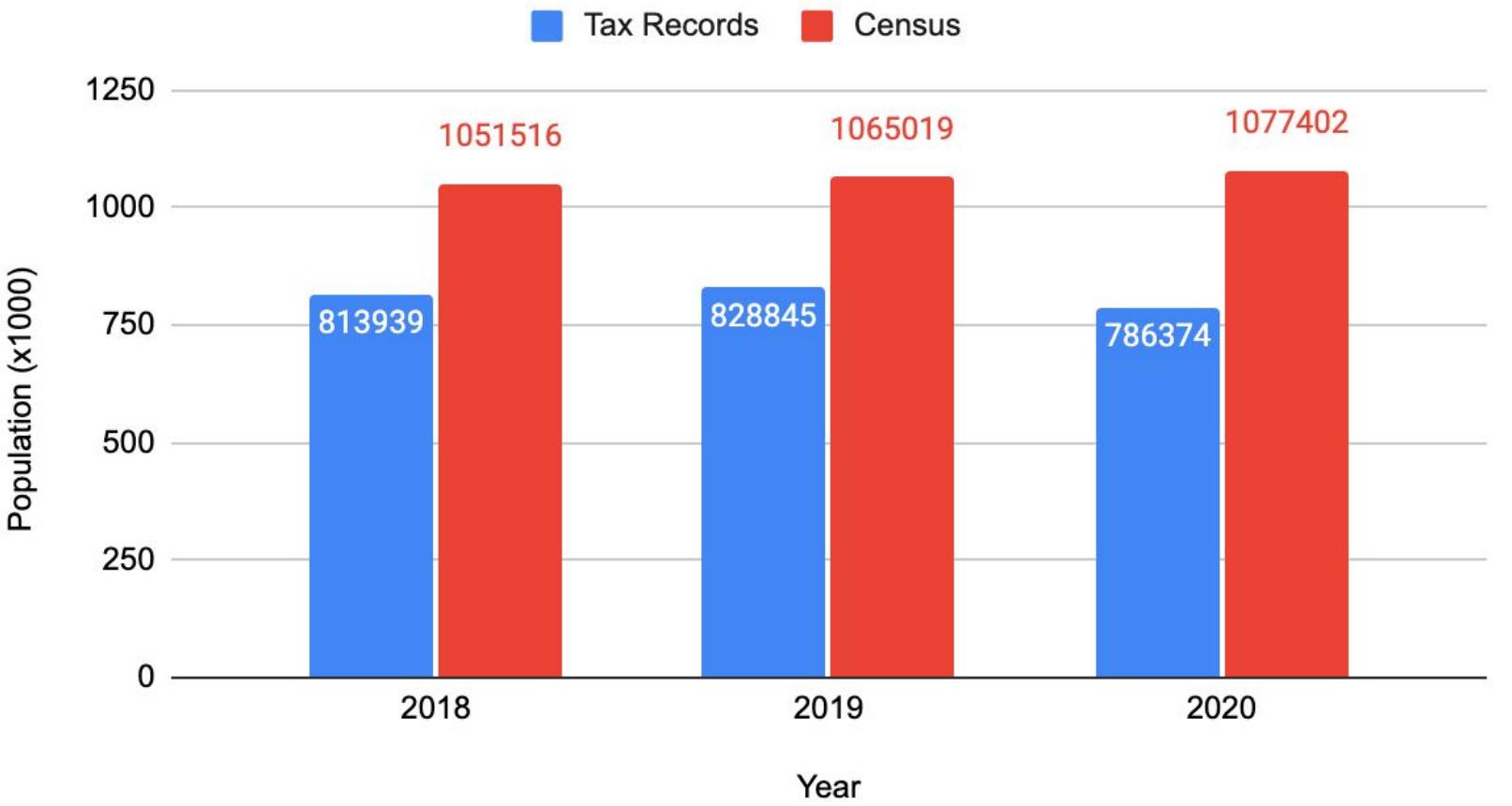




One Possible  
Reason: We do  
not have access  
to all the data

The census also pools data  
from SSN and Medicare

## Fulton County Population per Census vs per Tax Records



# Analysing this Discrepancy

Is the Census data wrong?

Is Fulton actually growing year by year? It should not be a trick question.

Is the ACS sampling method misleading?

It's a 10% sampling distribution which might not catch rare events.

Could it be that 300,000 people are not filing taxes in Fulton?

...This is probably not the case either.

# 06. Next Steps

---

## Revisit Old Methods with our rate approach

---

The takeaway idea from our approach is that predicting population is probably best conceptualized as 4 smaller prediction problems: Predicting births, deaths, outflow, and inflow.

## Revisit Proxies

---

Building Permits  
Voter Registration  
Poverty Rates  
School Enrollment  
Records  
Eviction Records

## Add Granularity

---

More complex (yet important!) social dynamics can be included if desired

# Where to go from here; Some Next Steps

Data Validation: We need to sort out what is causing this discrepancy with Fulton.



# Come Talk With Us!



We want to hear your thoughts & expertise on this topic :)



Thank  
You!