MISSOURI DEPARTMENT OF
HEALTH &
SENIOR SERVICES

Using Census Data to Estimate Single-Age Population Counts

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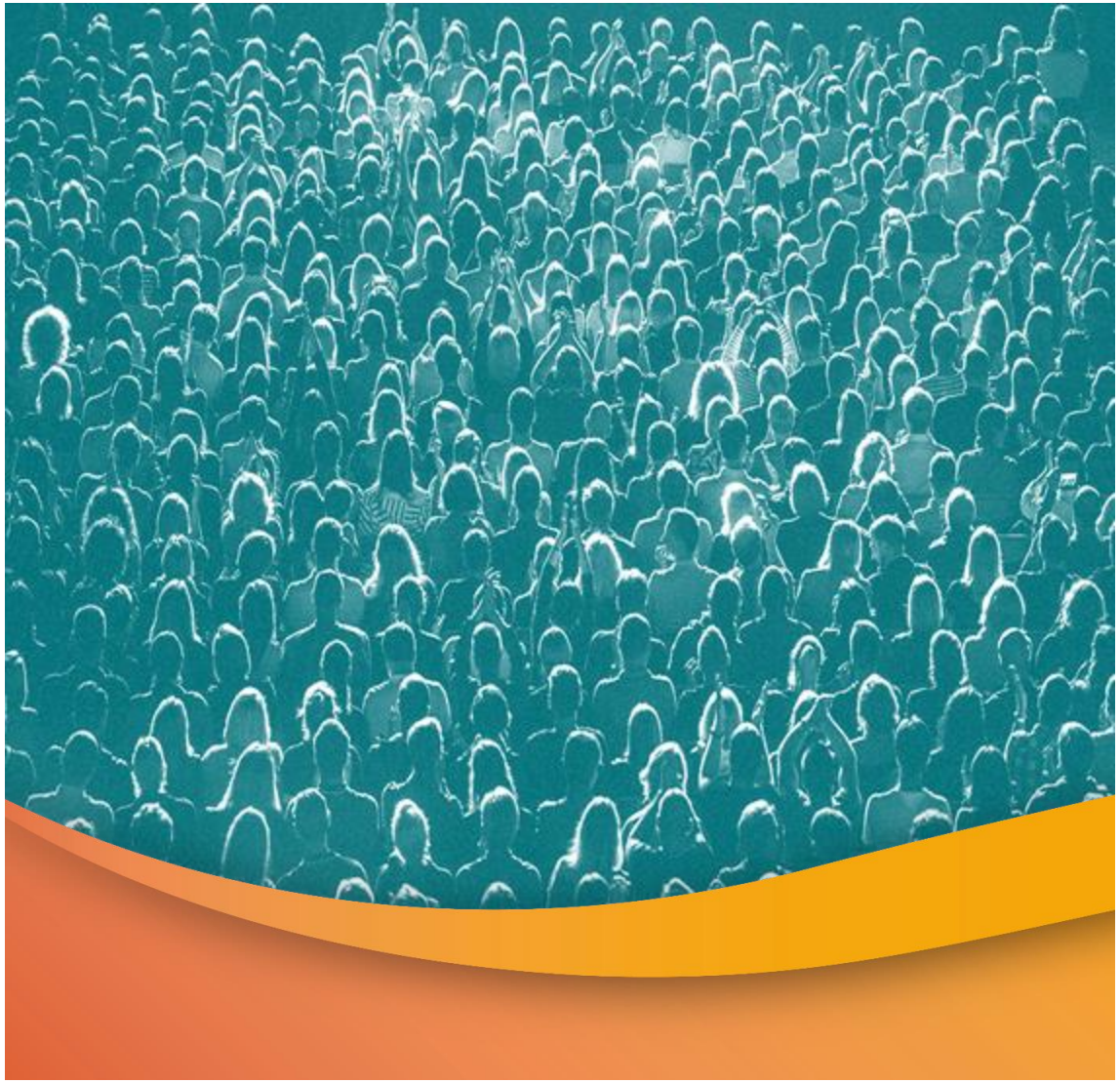
What do we need?

- **Baseline population numbers to generate rates yearly**
- **Population counts need to be –**
  - County-level
  - Single year of age
  - Divided by race, sex, and ethnicity
- **Counts must match Census counts on a state level across each sub-division**



What do we have?

Which Census products and existing internal data will help us create this estimation?

Census Data Products

Annual County Resident Population Estimates by Age, Sex, Race, and Hispanic Origin

- Uses the most recent vintage of census data
- Broken into county-level geographies
- Divided by five-year age groups

2020 Decennial Census

- Contains a single year of age for the year 2020
- Broken into county-level geographies
- Also divided by sex, race, and ethnicity

Missouri Data Products

Missouri Estimates for Single Year of Age 2021

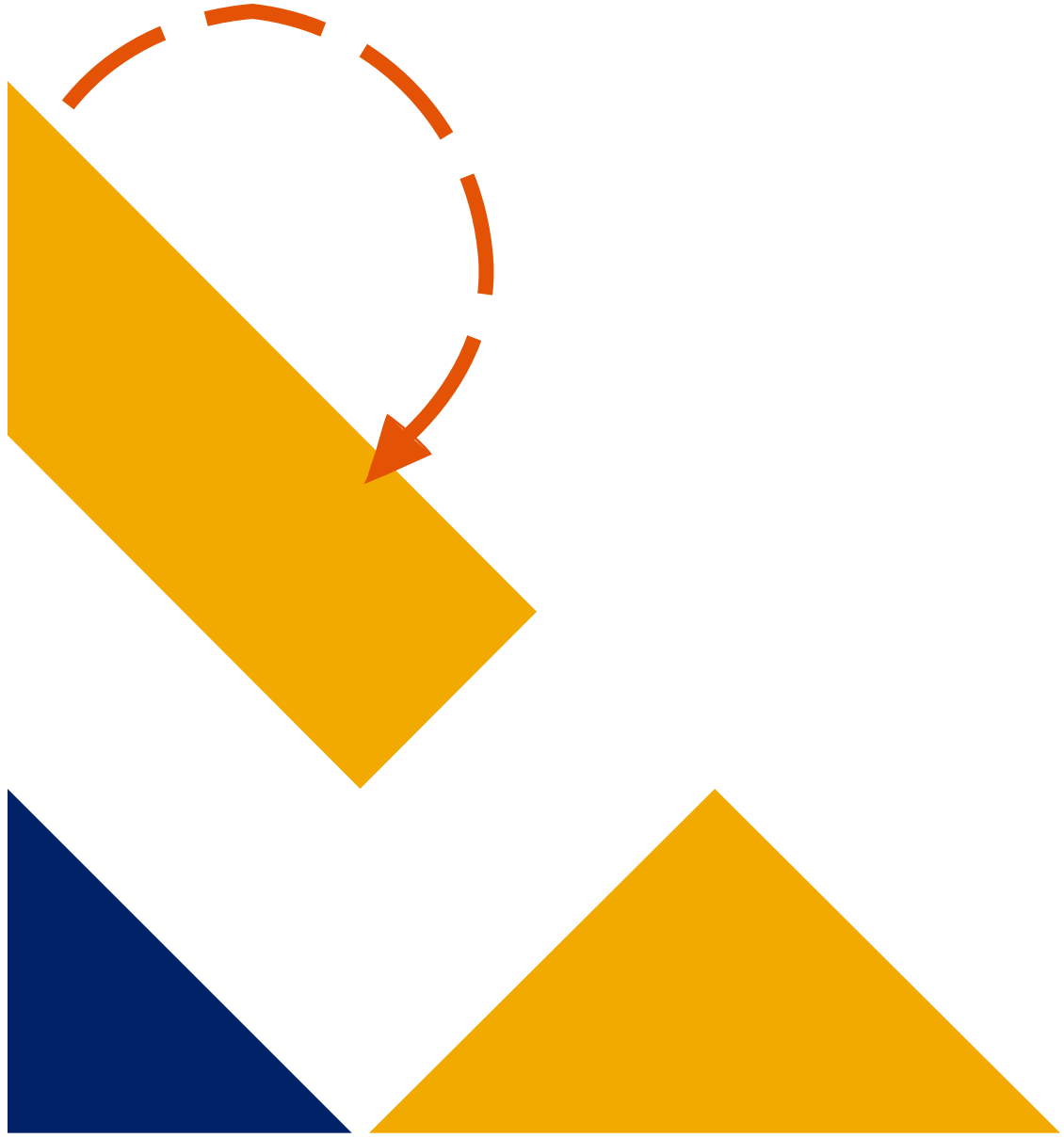
- Adapted from Census annual vintage population estimates
- Divided by sex, race, and ethnicity
  - Uses bridged-race as opposed to multi-race
- Broken into county-level geographies

2022 Missouri Birth File

- Contains data about all births occurring in MO for 2022
- Broken into county-level geographies with sex, race and ethnicity of the mother
- Used as a Missouri-specific estimate for the under-1-year population

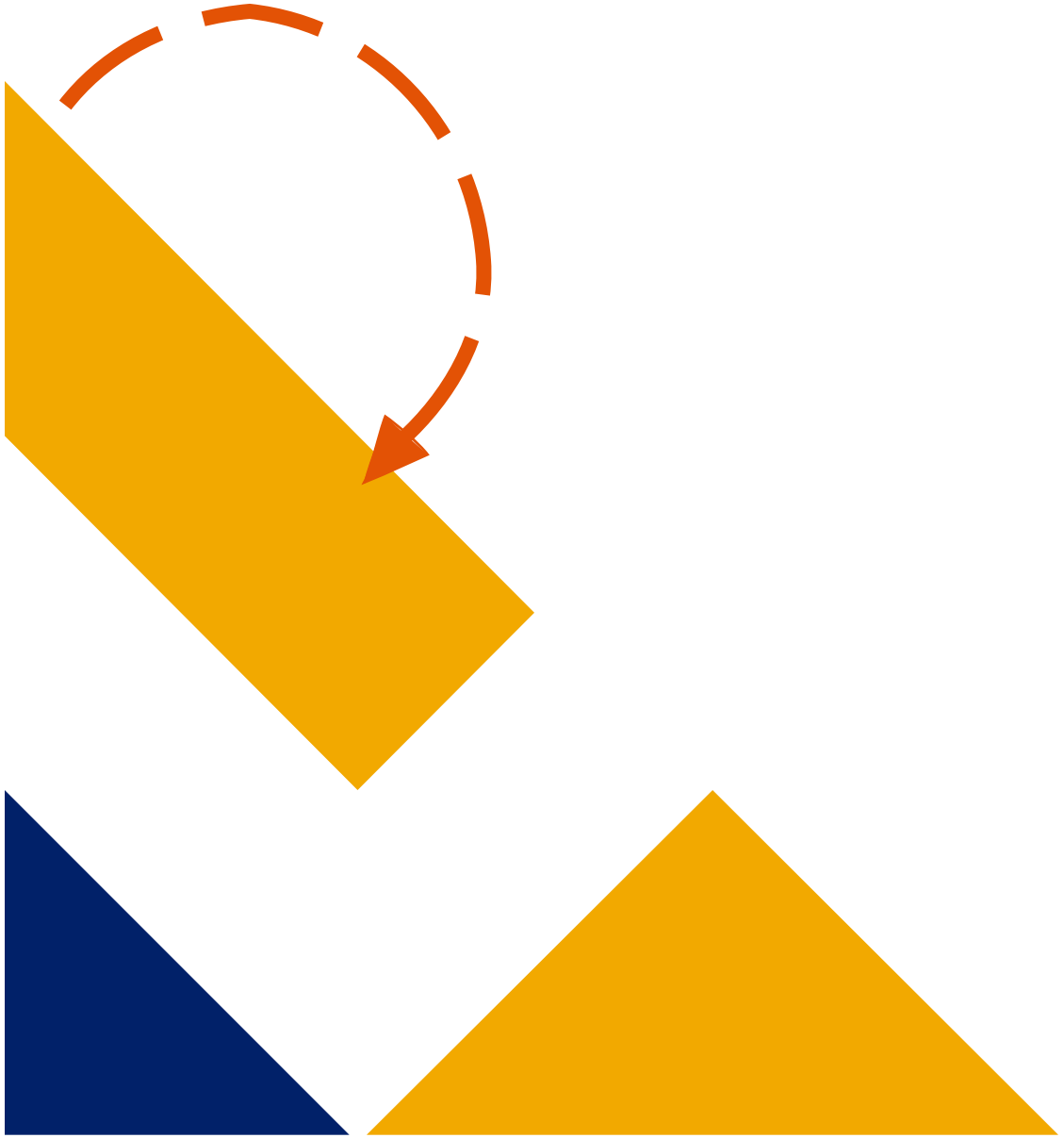
Methodology

- For every county, we consider the previous year's single year of age population counts.
- We calculate what percentage the previous single year of age takes inside the previous five-year age group.
- Since we have the current year five-year age group population estimate from the census, we can use the percentage to find the current year's single year of age estimates.



Methodology

- Once the unadjusted single year estimate is obtained, it goes through two stages of normalization:
    - Exponential smoothing with alpha=0.2
    - Three-year rolling average
- The single year ages are then summed within their five-year age groups.
    - The difference is evenly taken from the single year estimates so that the five-year groups match.



Methodology

- In a final adjustment phase, the single-year ages are summed to find single-year age totals by county (all races and ethnicities).
- Total is compared to the Census calculated single-year age totals for each county, and a control or rake factor is found

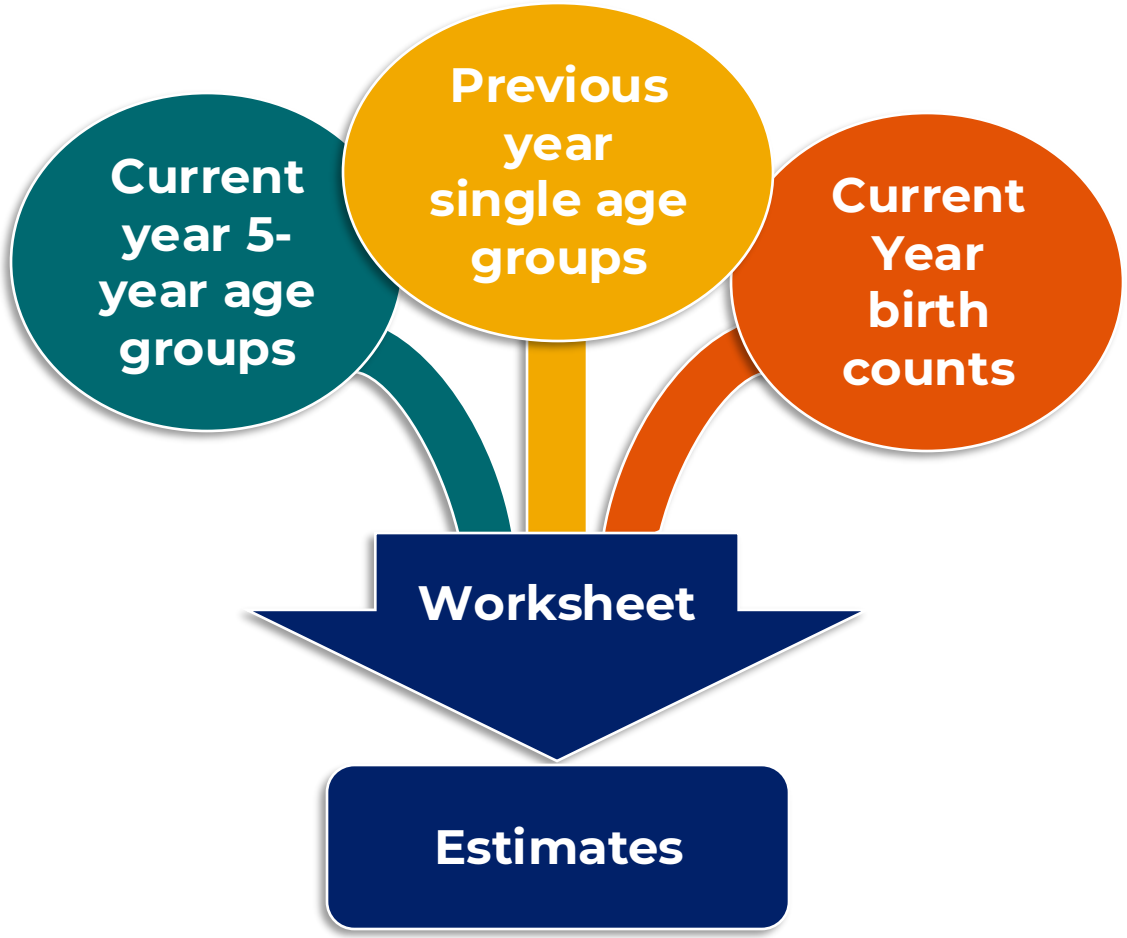
$$Rake\ Factor = \frac{County\ Single\ Year\ Age\ Total}{\sum Matched\ \ Estimate}$$

$$Final\ Matched\ Estimate = rounded\ (Rolled\ Average \cdot Rake\ Factor) + Difference$$

Our Process/Excel Usage

Reference tables:

- Current year's 18-level age-grouped population counts by county, race, sex, and ethnicity (census)
- Previous year's single age population counts by county, race, sex, and ethnicity (MO)
- Current year's birth counts by county, race, sex, and ethnicity (MO)



How the Birth File is Used

Since the vital statistics department has accessible detailed birth data, we utilize the birth file in population estimation

Advantages:

- Allows for a directly counted baseline for a single age population group
- The Missouri data source means higher reliability and consistency

Disadvantages:

- Does not factor in interstate travel of people under one year old
- Does not factor in deaths of people under one year old
- Can be discontinuous with 1-year-old age estimations from census data

Our Process/Excel Usage

- Excel functions pull from each of these reference tables for each county
- A single worksheet will create the estimates for a single race/ethnicity group (2 out of 20)
- Then the 10 worksheets will aggregate their estimates into a single county's estimation

		Results:	*Adair_County*					
		county	race/sex	hispanic	_NAME_	_0	_1	_2
WNHM	>	1	1	1	pop	...	...	...
WNHF	>	1	2	1	pop	...	...	...
BNHM		1	3	1	pop			
BNHF		1	4	1	pop			
ANHM		1	5	1	pop			
ANHF		1	6	1	pop			
TMNHM		1	7	1	pop			
TMNHF		1	8	1	pop			
ONHM		1	9	1	pop			
ONHF		1	10	1	pop			
WHM		1	1	2	pop			
WHF		1	2	2	pop			
BHM		1	3	2	pop			
BHF		1	4	2	pop			
AHM		1	5	2	pop			
AHF		1	6	2	pop			
TMHM		1	7	2	pop			
TMHF		1	8	2	pop			
OHM		1	9	2	pop			
OHF		1	10	2	pop			

Dataset Structure

County	Race/Sex	Hispanic	Name	0	1	...	84	85+
1	1	1	pop	...	...	...	...	...
1	2	1	pop	...	...	...	...	...
1	...	1	pop	...	...	...	...	...
1	9	1	pop	...	...	...	...	...
1	10	1	pop	...	...	...	...	...
1	1	2	pop	...	...	...	...	...
1	2	2	pop	...	...	...	...	...
1	...	2	pop	...	...	...	...	...
1	9	2	pop	...	...	...	...	...
1	10	2	pop	...	...	...	...	...

Our Process/Excel Usage

- This process is done for all 115 Missouri counties to create a full state population estimate
- Before last-touch manual adjustments, the total will be ~0.005% from the census-estimated state total
- The last handful of records are manually adjusted to keep county, age, and race groups balanced

county	racesex	hispanic	_NAME_	birth_0	_1	_2
1	1	1	pop	…	…	…
1	2	1	pop	…	…	…
1	3	1	pop	…	…	…
1	4	1	pop	…	…	…
1	5	1	pop	…	…	…
1	6	1	pop	…	…	…
1	7	1	pop	…	…	…
1	8	1	pop	…	…	…
1	9	1	pop	…	…	…
1	10	1	pop	…	…	…
1	1	2	pop	…	…	…
1	2	2	pop	…	…	…
1	3	2	pop	…	…	…
1	4	2	pop	…	…	…
1	5	2	pop	…	…	…
1	6	2	pop	…	…	…
1	7	2	pop	…	…	…
1	8	2	pop	…	…	…
1	9	2	pop	…	…	…
1	10	2	pop	…	…	…

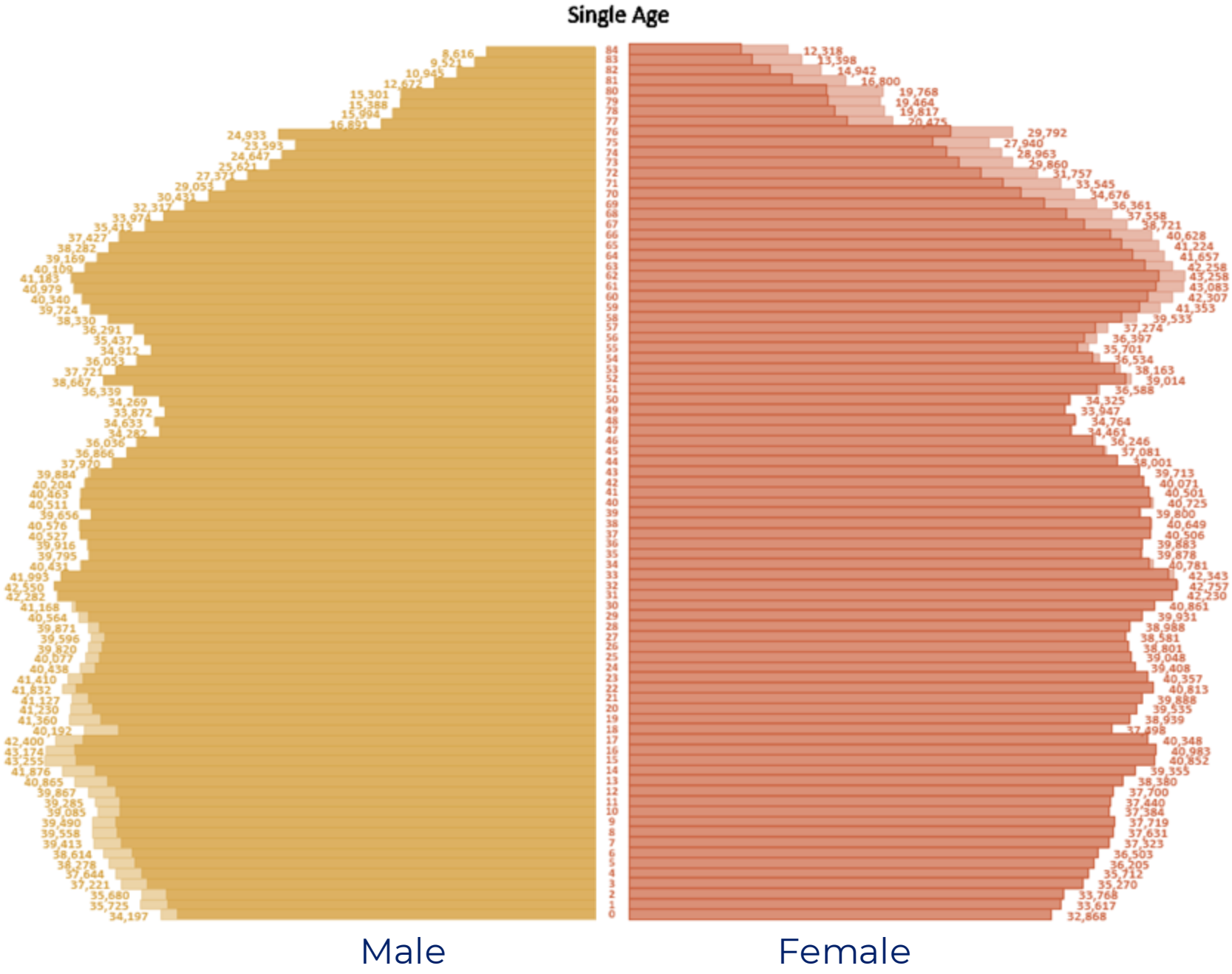
Our Process/Excel Usage

- Final dataset is 2,300 rows and 90 columns and allows for more specific data analysis tools like population pyramids

county	racesex	hispanic	_NAME_	birth_0	_1	_2
229	1	1	pop	...	...	...
229	2	1	pop	...	...	...
229	3	1	pop	...	...	...
229	4	1	pop	...	...	...
229	5	1	pop	...	...	...
229	6	1	pop	...	...	...
229	7	1	pop	...	...	...
229	8	1	pop	...	...	...
229	9	1	pop	...	...	...
229	10	1	pop	...	...	...
229	1	2	pop	...	...	...
229	2	2	pop	...	...	...
229	3	2	pop	...	...	...
229	4	2	pop	...	...	...
229	5	2	pop	...	...	...
229	6	2	pop	...	...	...
229	7	2	pop	...	...	...
229	8	2	pop	...	...	...
229	9	2	pop	...	...	...
229	10	2	pop	...	...	...

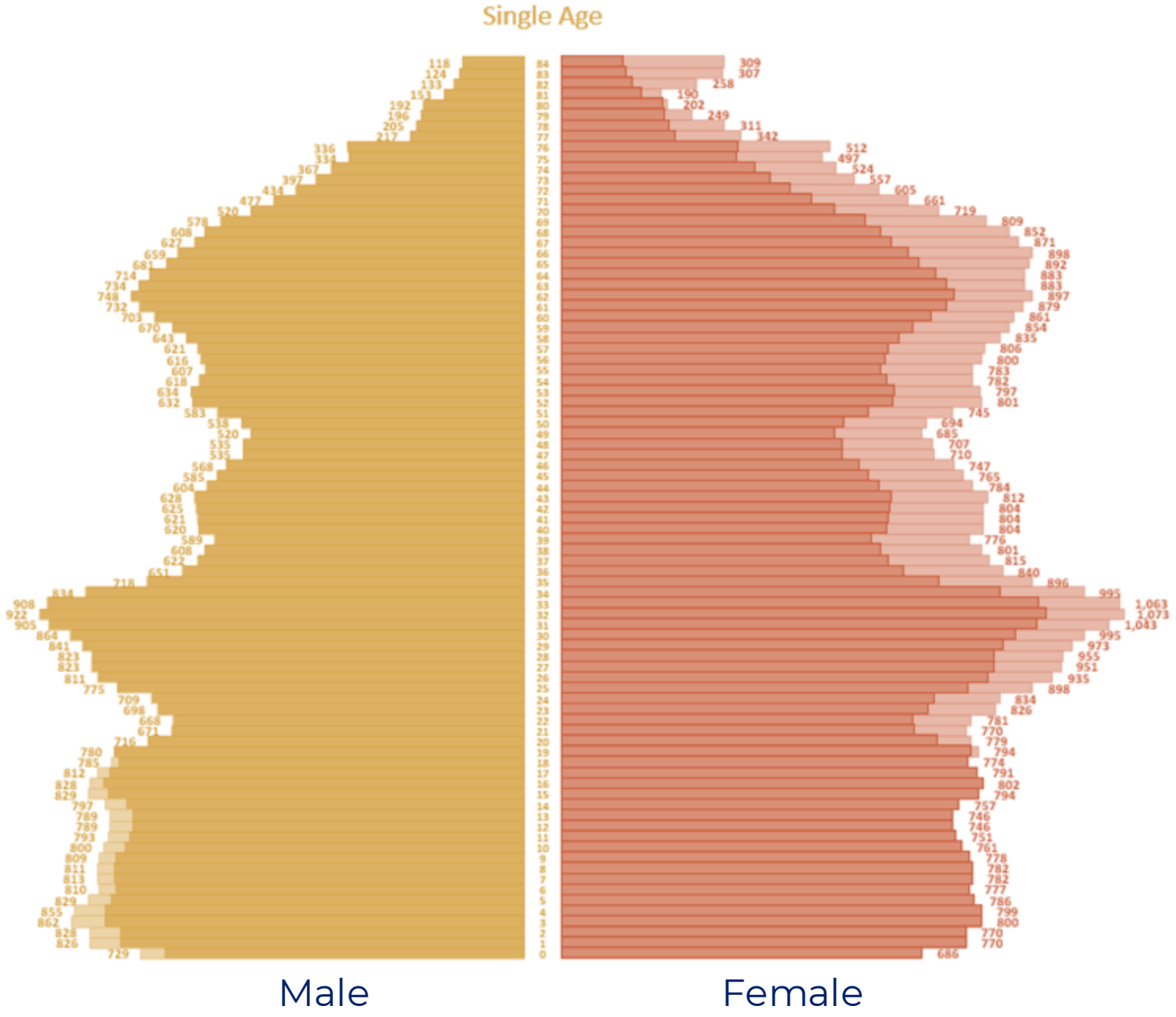
Missouri 2023 Population Pyramid

- All races, statewide
- With a 3-year rolling average and exponential smoothing.



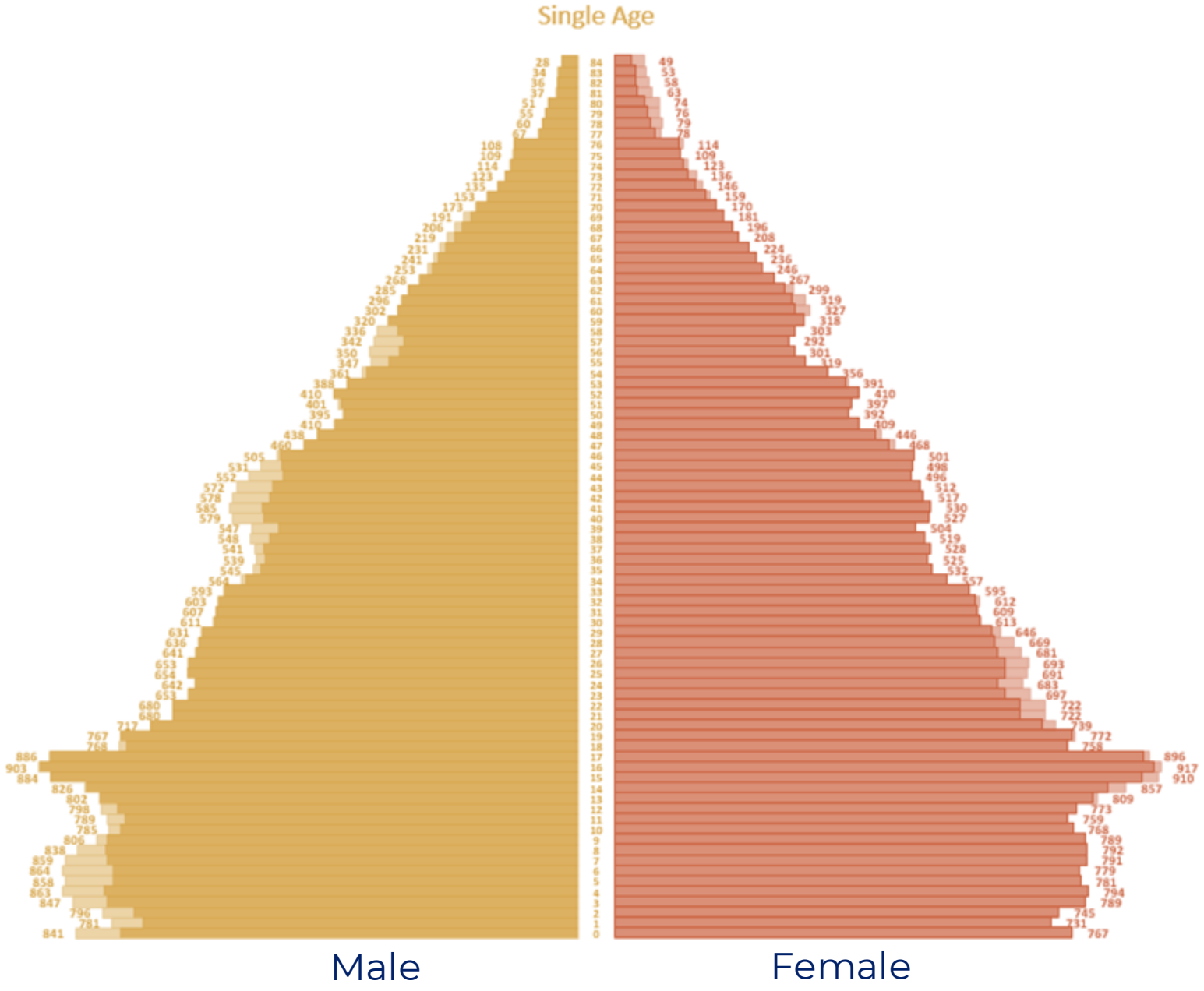
St. Louis City 2023 Population Pyramid

- Non-Hispanic Black/African American, St. Louis City
- With a 3-year rolling average and exponential smoothing.



Kansas City 2023 Population Pyramid

- Hispanic, all races, Jackson County (Kansas City)
- With a 3-year rolling average and exponential smoothing.



Other Applications

- Custom age groupings allow for more specific data queries from shareholders, like local public health agencies
- Through our **MICA** (Missouri Information for Community Assessment) website, the estimated population dataset allows public access to specific demographic information

2021 Population		
Women 15-44		
	Count	% of Total Population
Missouri	1,188,885	19.3%

2021 Population		
Children 0-18		
	Count	% of Total Population
Missouri	1,461,361	23.7%

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THANK YOU!