

Census Insights & Updates

Tim Kuhn



BOYD CENTER FOR BUSINESS &
ECONOMIC RESEARCH



Tennessee State Data Center

About the Boyd Center

- Since 1937
- Non-partisan business and economic research think tank
- Policy-oriented research for federal, state, and local governments, businesses, and non-profits
- Houses the [Tennessee State Data Center](#)

Topics and outcomes for today's presentation

Agenda Topics

- ACS Public Use Microdata
- 2020 Census Urban Areas
- Population Estimates
- Boyd Center Projections
- Employment Resources

Goals

- Bring you to speed on latest data and evolving thinking around Census data topics
- Ideas for additional talks, presentations and discussions

2022 PUMS & PUMAs for Tennessee and the cloudy future of ACS
PUMS

ACS PUBLIC USE MICRODATA SAMPLES

ACS Microdata Definitions

Public Use Microdata Sample

- Annual 1-Year and 5-Year release
- Anonymized ACS responses with disclosure protections
- Include about two-thirds ACS responses
- Used to generate custom estimates and tables not found in ACS pre-tabulated data

Public Use Microdata Areas

- Updated after decennial census
- Non-overlapping areas with around 100,000 residents
- Most detailed geographic units in PUMS data
- Defined by State Data Centers (SDCs)

Example of Custom Table Extracted using MDAT

Custom Table CUSTOMIZE VARIABLES DOWNLOAD / SHARE DETAILS

Dataset: ACS 1-Year Estimates Public Use Microdata Sample
[CHANGE DATASET](#)

Geography: 1 geographies selected [CHANGE GEOGRAPHY](#)

Vintage: 2022

Weighting: PUMS person weight

On Columns

MIGSP

On Rows

JWTRNS_RC1

Not on Table

Selected Geographies **ESR**

Values in table cells:

Count

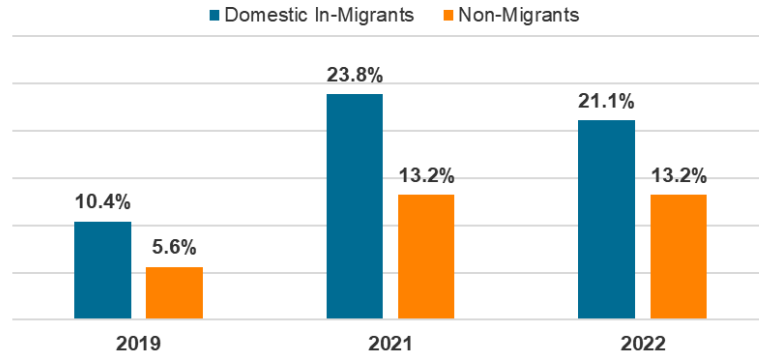
Universe: selected geographies: Tennessee; Migration recode - State or foreign country code (MIGSP): Alabama/AL, Alaska/AK, Arizona/AZ, Arkansas/AR, California/CA, Colorado/CO, Connecticut/CT, Delaware/DE, District of Columbia/DC, Florida/FL,

Show Total

	Migration recode - State or foreign country code (MIGSP)			
Means of transportation to work recode	Total	Alabama/AL	Alaska/AK	Arizona/AZ
Total (2)	116,549	5,250	393	
Worked from home	24,554	855	0	
Traveled to work	91,995	4,395	393	

[URL Custom Table](#)

Tennessee Work from Home Rates in 2019 - 2022



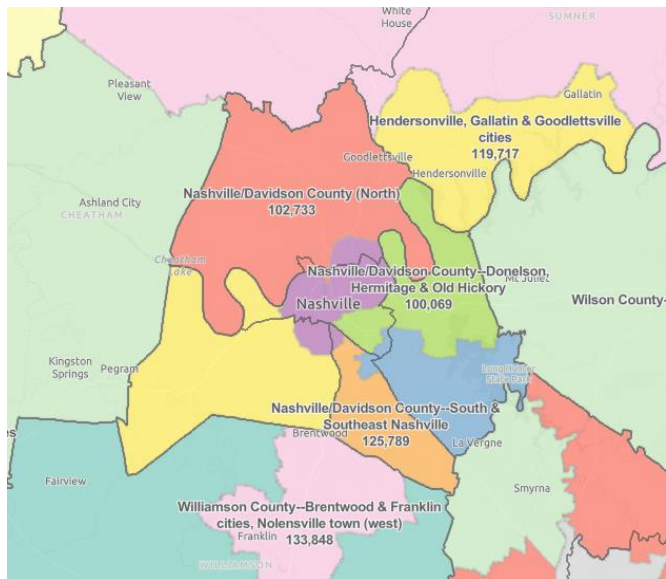
Source: ACS 1-year PUMS, U.S. Census Bureau, 2019 & 2021, 2022
Universe: Civilian employed, at work

TNSDC
Tennessee State Data Center

[illegible]

2022 Tennessee PUMA Enhancements

Davidson County realigned to Planning Subareas

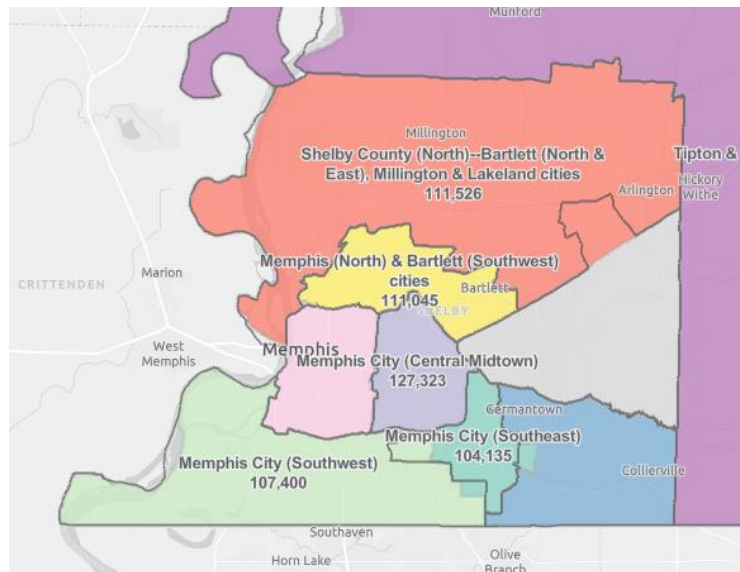


Knox County realigned to Planning Sectors

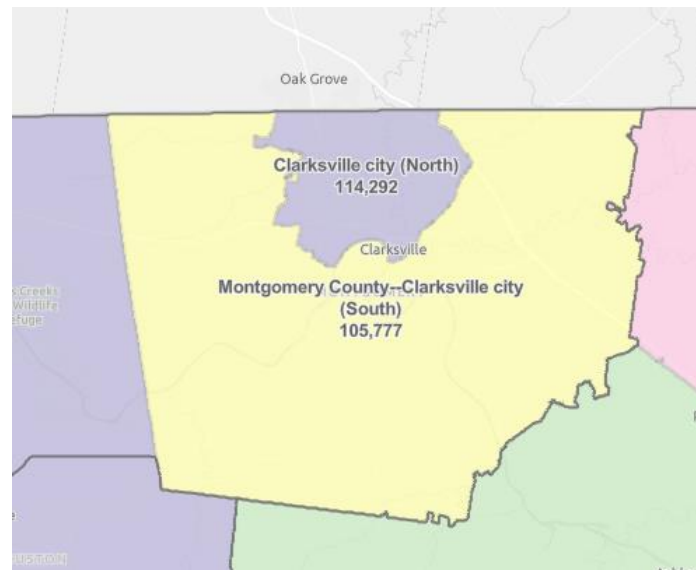


2022 Tennessee PUMA Enhancements

Shelby County realigned to maintain 100,000 people per PUMA



Two PUMAs created in Montgomery County



2022 Tennessee PUMA Cautions



- Boundaries for just 10 PUMAs from 2010 were retained in 2020-based PUMAs
- PUMAs were renumbered, but some GEOIDs were reused

Current Protections of ACS Microdata

Details of ACS PUMS disclosure avoidance is secret but includes these methods

- Swapping (Household members and geographies)
- Partial synthesis ([Group Quarters](#))
- Perturbation
- Top and bottom coding
- Coarsening
- Subsampling

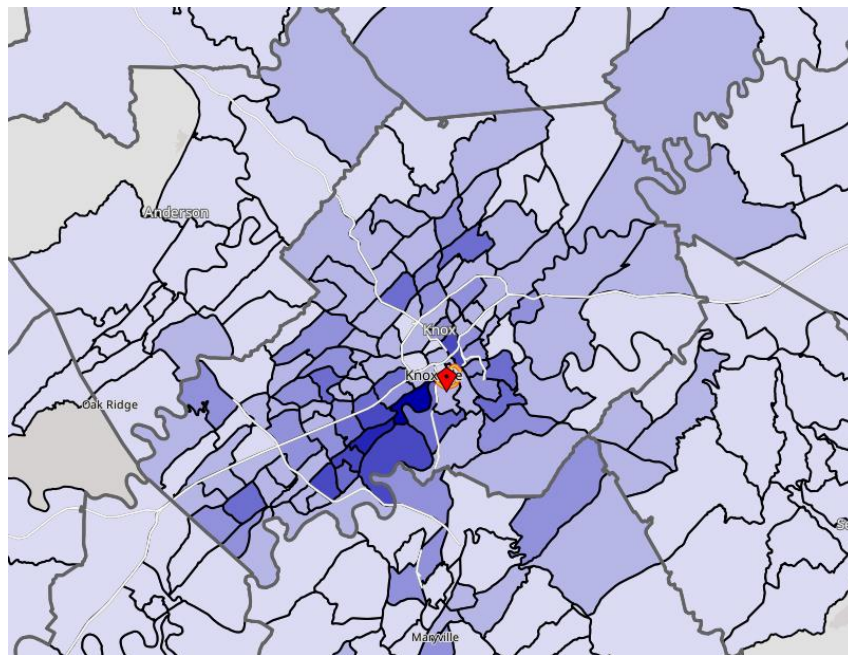
Proposal: Fully Synthetic ACS PUMS

- Reconstruction and reidentification concerns prompting discussion about additional protection
- In [data confidentiality applications](#), synthetic data are modeled statistical outputs released in a format that closely resembles the confidential data format

Synthetic Data: On the Map (LODES)

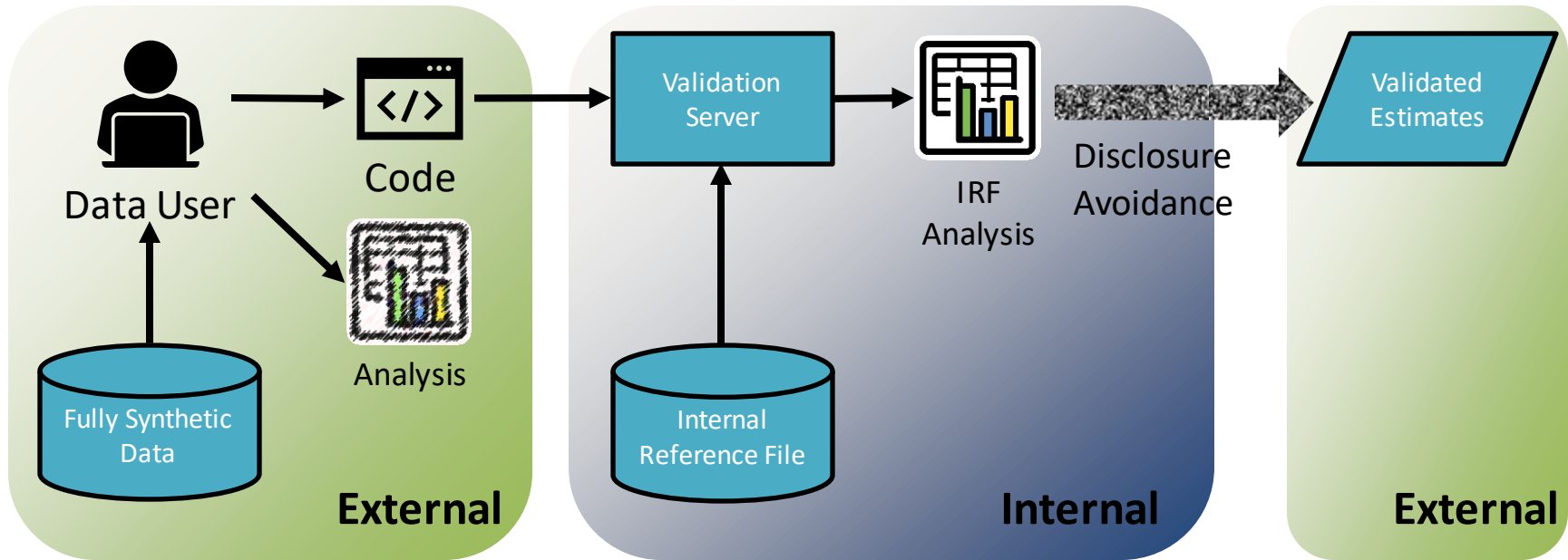
- LODES links employee residence with employer (UI and QCEW)
- Couldn't be released without safeguards confidentiality of worker residential location

“partially synthetic data on workers' residential patterns”



Residence of UTK Area Employees

Proposed Data Synthesis and Validation Process



Source: "Confidentiality for American Community Survey Respondents" – Rolando Rodriquez, U.S. Census Bureau presentation to FSCPE

Considerations for PUMS Users

Upside

- Improve ACS declining response rates
- Validation requests are run against internal data not yet subjected to disclosure avoidance
- Analysis based on full sample rather than the PUMS two-thirds subsample
- Sub-state analysis other than PUMA-level

Downside

- Modeled data captures most important relationships between variables but less common must be intentionally baked into the model
- Synthetic data are poorly suited to studying rare relationships in households because true variation is masked
- Incorporate only individual-level interrelationships among variables, in which case analysis across household members would be impossible

- [“Synthetic Microdata from the American Community Survey”](#), IPUMS (Minnesota Pop. Center)

TDM Modelers Using PUMS Need to be Involved Early and Often in the PUMS Synthesis Discussion

“This research may indicate a necessity for also considering whether there are certain combinations of variables whose relationships are particularly important from a policy or programmatic perspective and whether there are ways to ensure that these relationships are preserved, even if they are not the strongest relationships in the data.”

-Freiman, Rodriguez, Reiter, Lauger

Recent corrections and plans for 2020

2020 URBAN AREAS

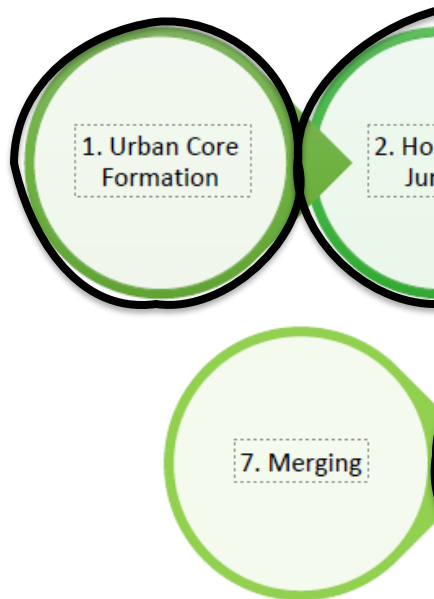
2020 Census UA Delineation: Key Criteria Changes

1. Minimum threshold raised from 2,500 people to 2,000 housing units or at least 5,000 people
2. Delineation based housing unit data at only the census block level instead of only population data at various geographic levels
3. Maximum jump distance reduced from 2.5 miles to 1.5 miles.
4. Commuter data used to split large urban agglomerations
5. No longer distinguish “urban areas” as “urbanized areas” or “urban clusters”

Source: [Urban Areas Team Geography Division presentation](#) to Census State Data Centers (7/26/2023)

Urban Areas

OS



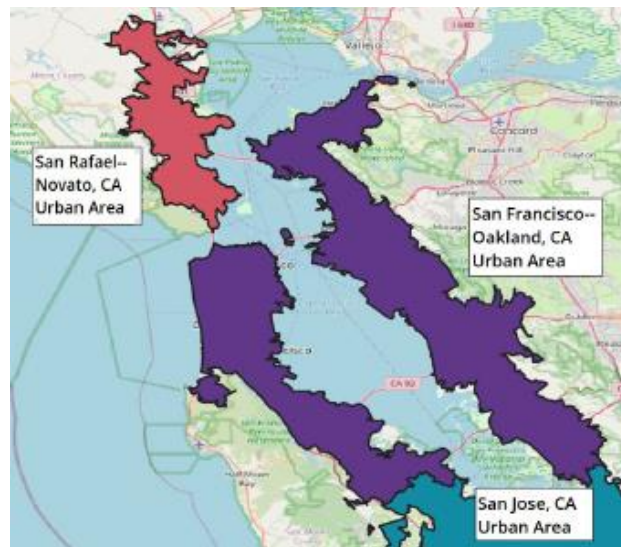
Source: [Urban Areas Team Geography Division presentation](#) to Census State Data Centers (7/26/2023)

Urban Area Corrections

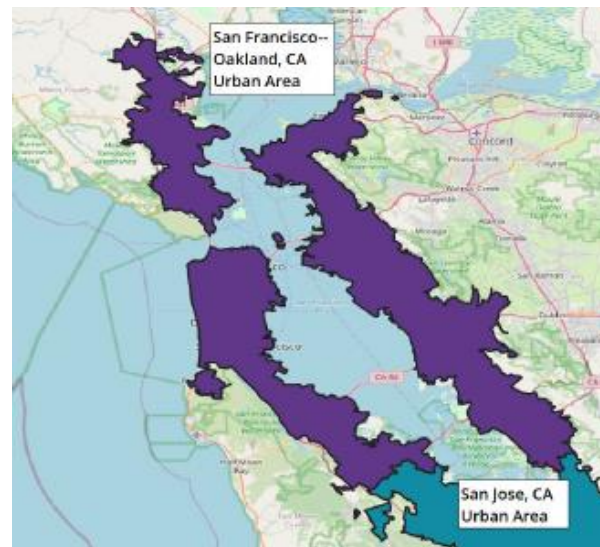
- UA [corrections announced](#) September 12, 2023
- Additional corrections to 2020 UA's not expected and there is no formal appeal/review
- Past urbanized area corrections
 - 2000
 - Two procedural corrections ([1](#), [2](#))
 - Delineation corrections determined to be clerical errors ([3](#), [4](#))
 - 2010
 - No corrections issued

San Francisco--Oakland, CA and San Rafael--Novato, CA Urban Areas

Original



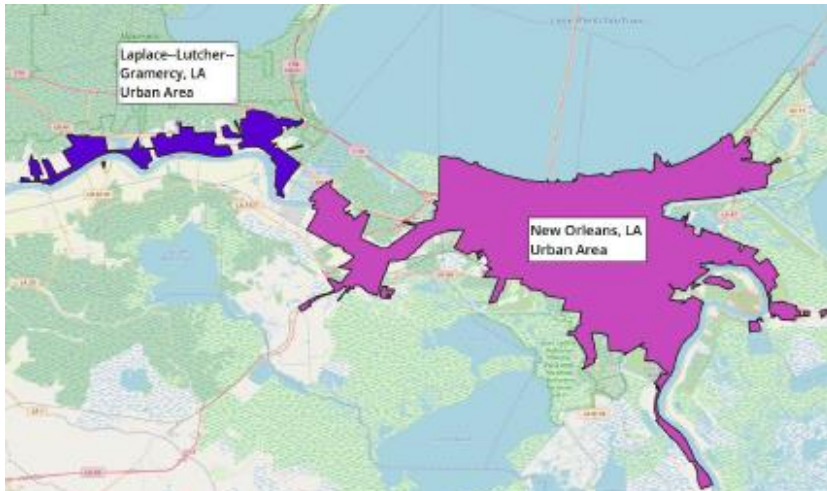
Corrected (Feb. 2023)



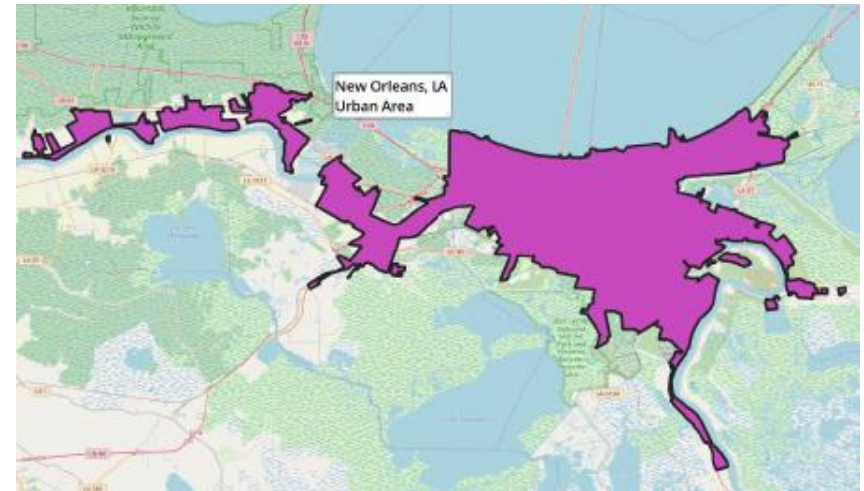
Source: [Urban Areas Team Geography Division presentation](#) to Census State Data Centers (7/26/2023)

New Orleans, LA and Laplace--Lutcher--Gramercy, LA Urban Areas

Original



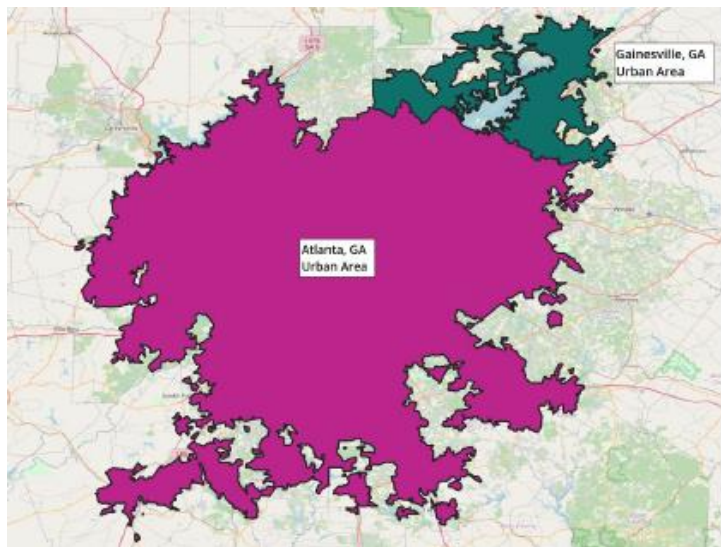
Corrected (July 2023)



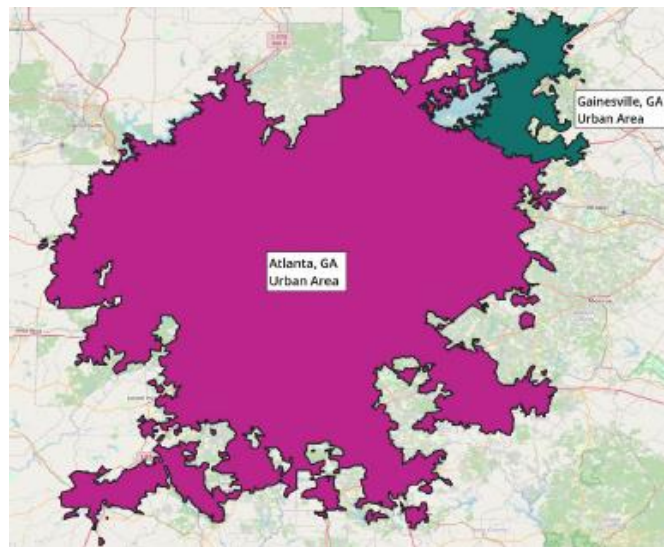
Source: [Urban Areas Team Geography Division presentation](#) to Census State Data Centers (7/26/2023)

Atlanta, GA and Gainesville, GA Urban Areas

Original

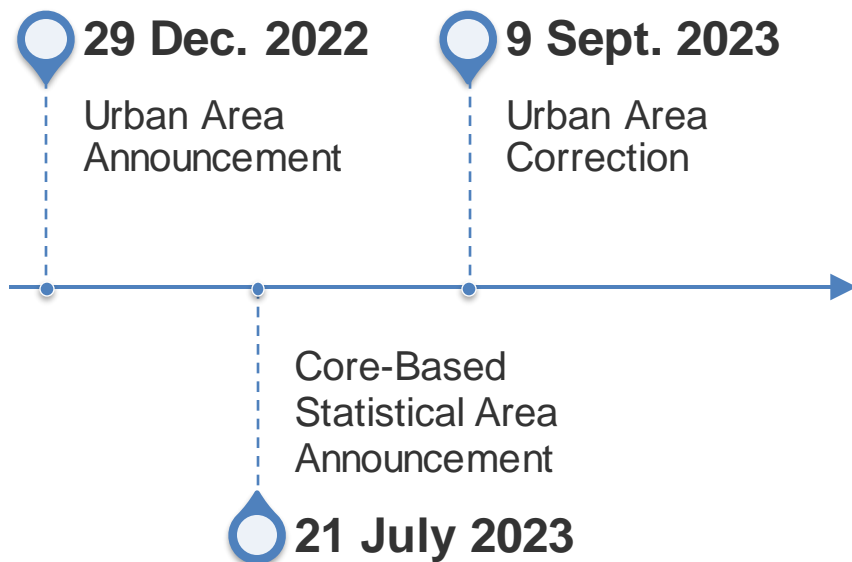


Corrected (July 2023)



Source: [Urban Areas Team Geography Division presentation](#) to Census State Data Centers (7/26/2023)

Timeline of UA Corrections



CBSA Core-County Delineation Criteria:

- a) Have at least 50 percent of their population in Urban Areas of at least 10,000 population; or
- b) Have within their boundaries a population of at least 5,000 located in a single Urban Area of at least 10,000 population.

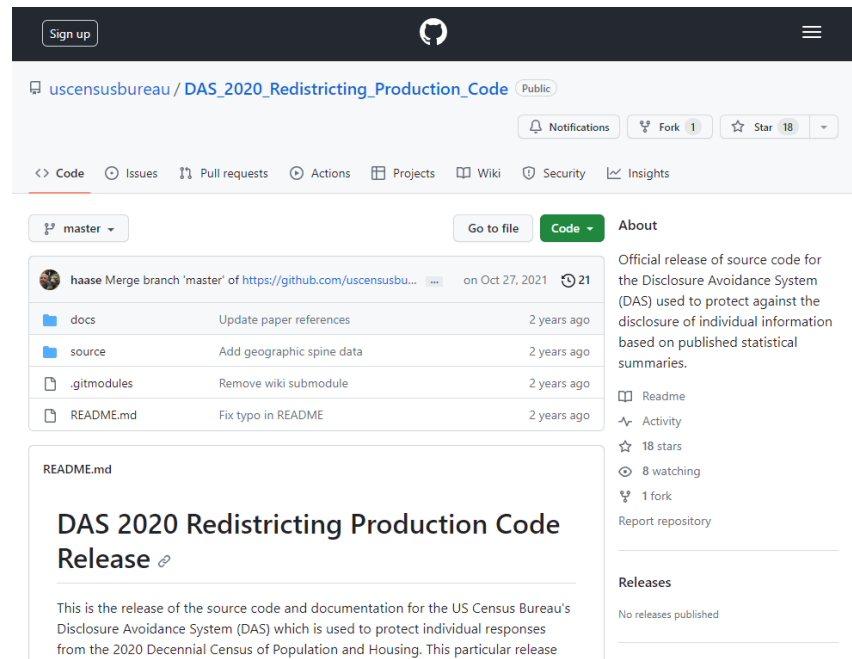
UA Criteria: Beyond 2020

- Do not anticipate significant UA criteria changes
- Will consider additional land use datasets to identify exempted territory
 - Datasets must be nationally-consistent and freely-available sources
- Additional enhancements being considered
 - Rural/Urban continuums similar to USDA RUCA
 - Grid-based delineation in addition to “traditional” UA delineation
- Can we open the delineation process?

Source: [Urban Areas Team Geography Division presentation](#) to Census State Data Centers (7/26/2023)

Request to open the Urbanized Area Delineation code

- Python-based delineation software used by Census Bureau
- Other projects posted to GitHub
- Collaborate in request to open delineation code



https://github.com/uscensusbureau/DAS_2020_Redistricting_Production_Code

Census Gridded Data – Be involved early and often

What we know

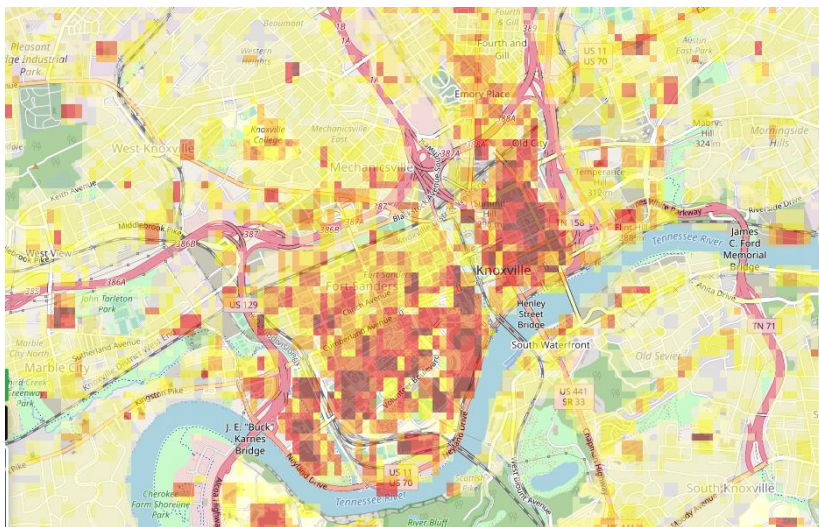
- Prototype gridded housing unit dataset by 2027
- Collecting input at geo.grids@census.gov

To Be Determined:

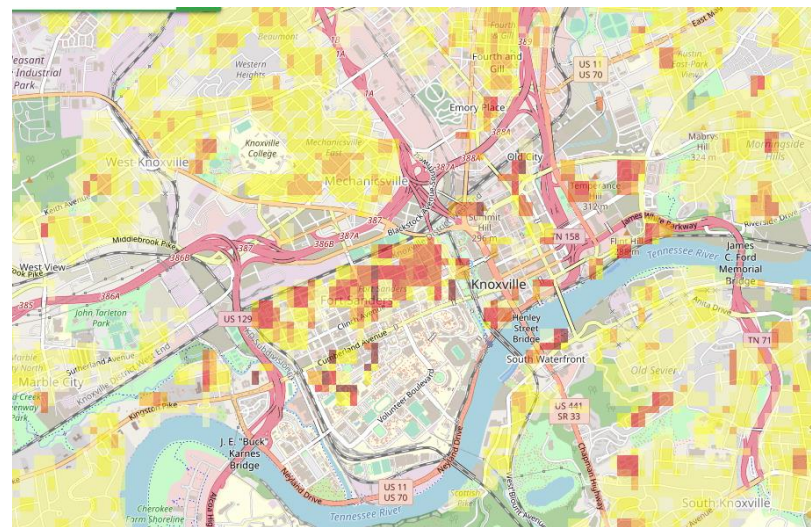
- Datasets and sources for conversion
 - ACS, Decennial, Economic
- Raster v. vector
- Cell size and shape

ORNL Landscan USA offers 90M population grids

Daytime Population



Nighttime Population



<https://landscan.ornl.gov/>

Births, Deaths and Migration

OVERVIEW OF RECENT POPULATION TRENDS FROM POPULATION ESTIMATES

Tennessee Population Recap: 2010 to 2020

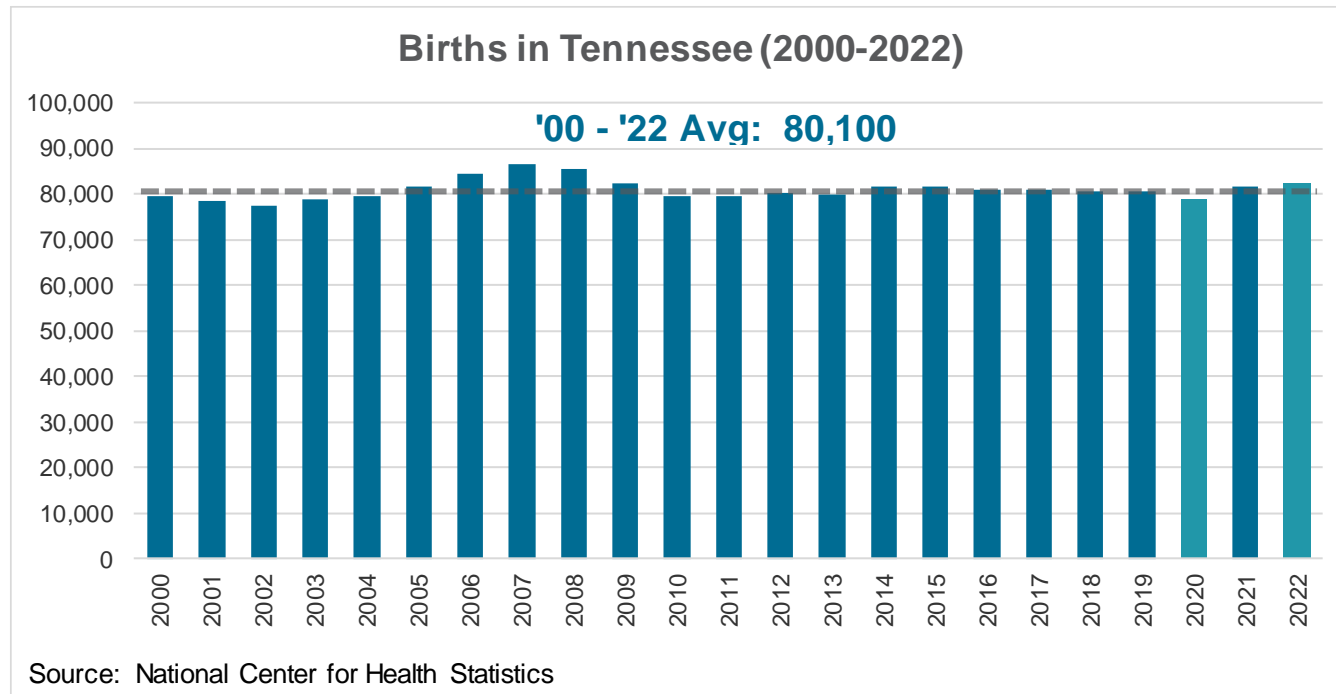


Source: 2010 and 2020 Decennial Census, U.S. Census Bureau

Components of Population Change

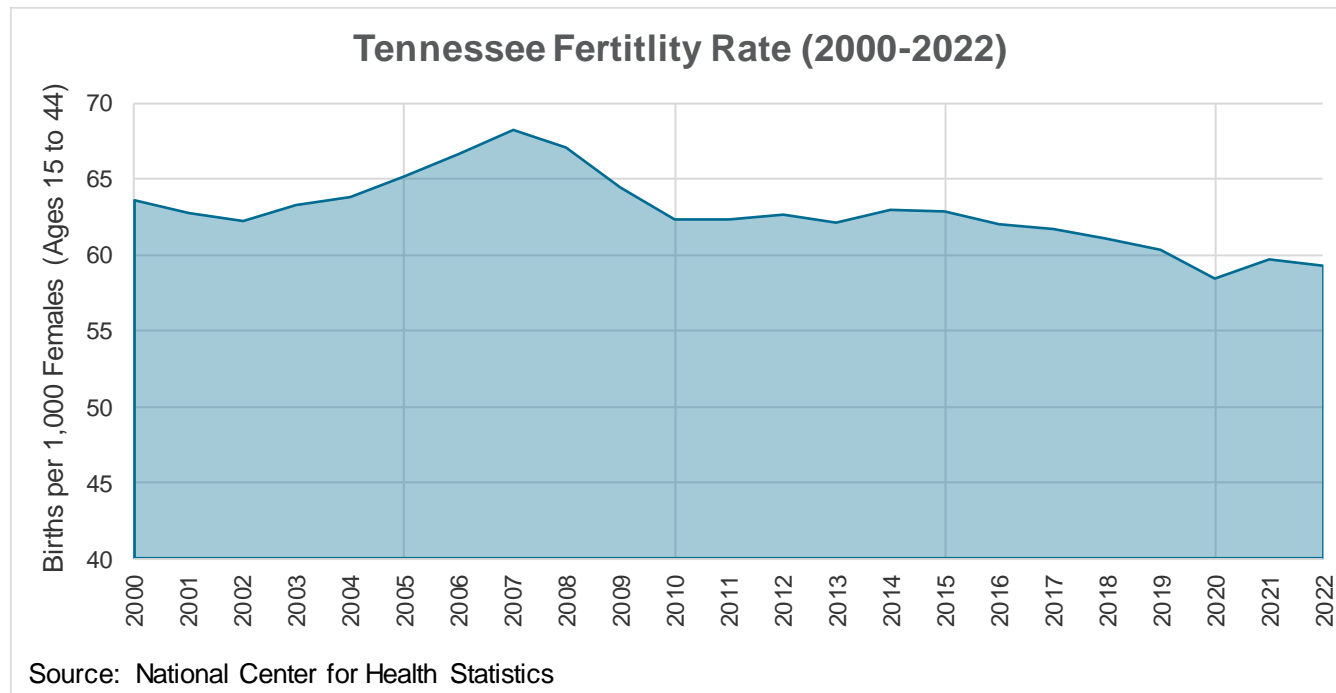
- Natural Population Change
 - Births
 - Deaths
- Migration

Despite a 1.45-million-person population increase since 2000, births have remained nearly flat



- 2020 (78,769)
lowest since
2002
- 2022 (82,265)
most since 2008

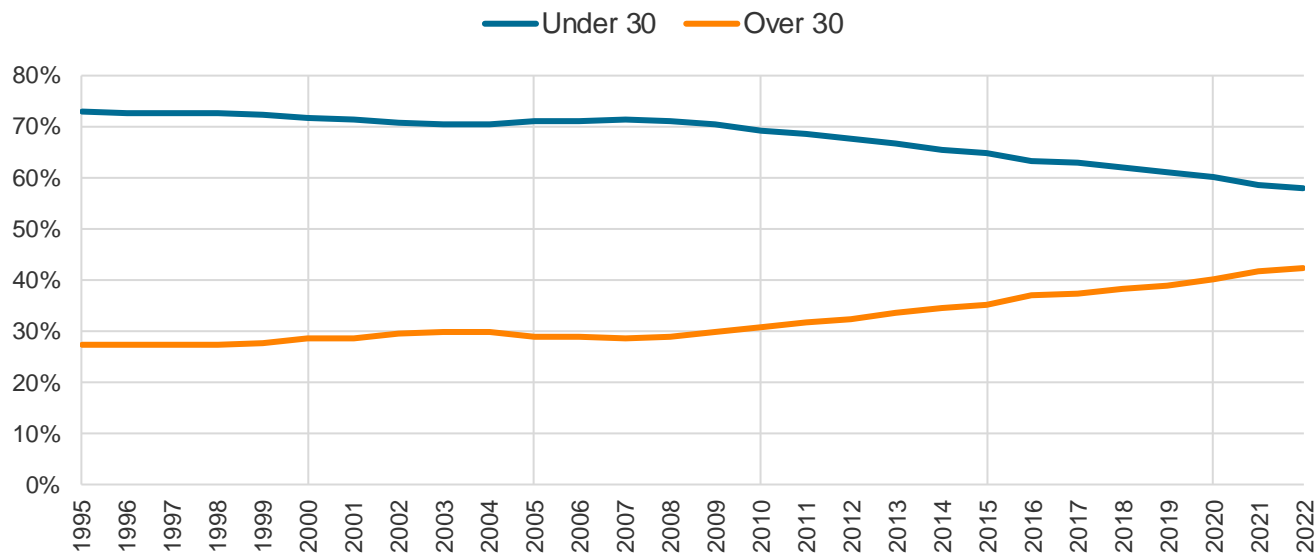
After a “bump” in 2021, fertility rates have returned to trend



- Fertility fell 12 out of last 15 years
- At or near historic lows (early 1970's)

In 2022, 42 percent of births in the state were to mothers over 30 years of age

Share of Births by Mother's Age in Tennessee



Source: National Center for Health Statistics

2007-2022

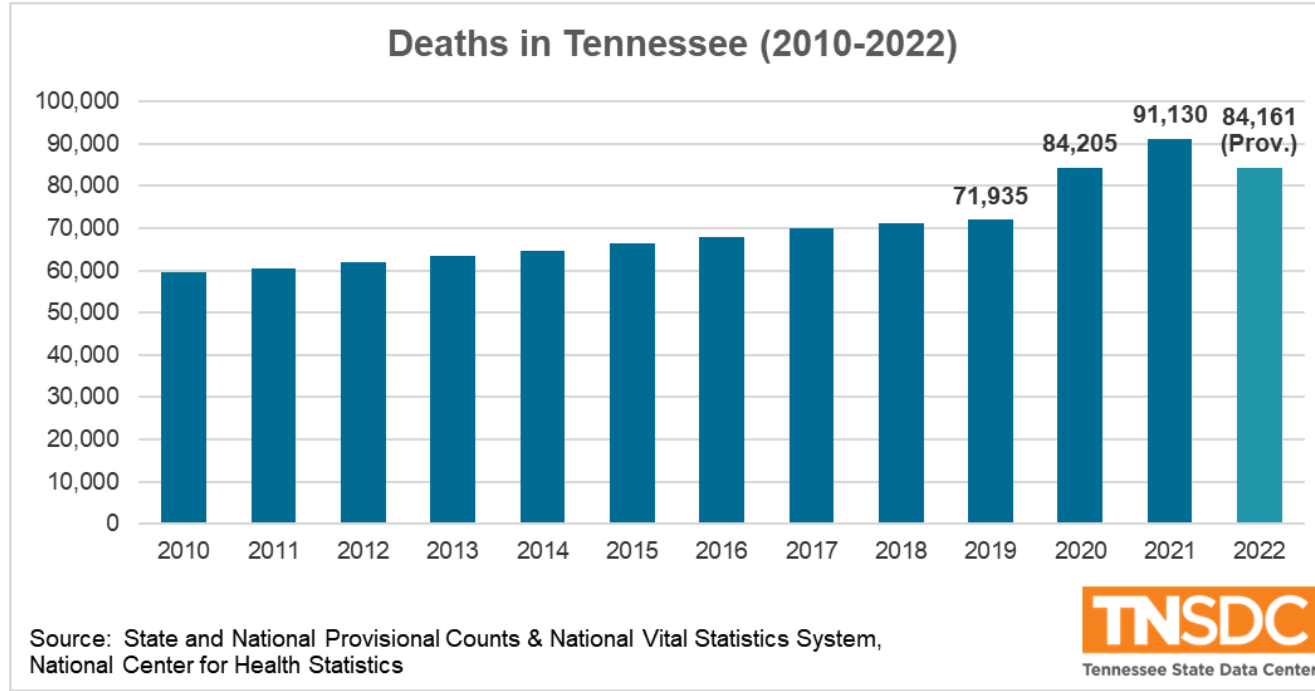
Mother's age

20-24: -30.2%

25-29: +1.0%

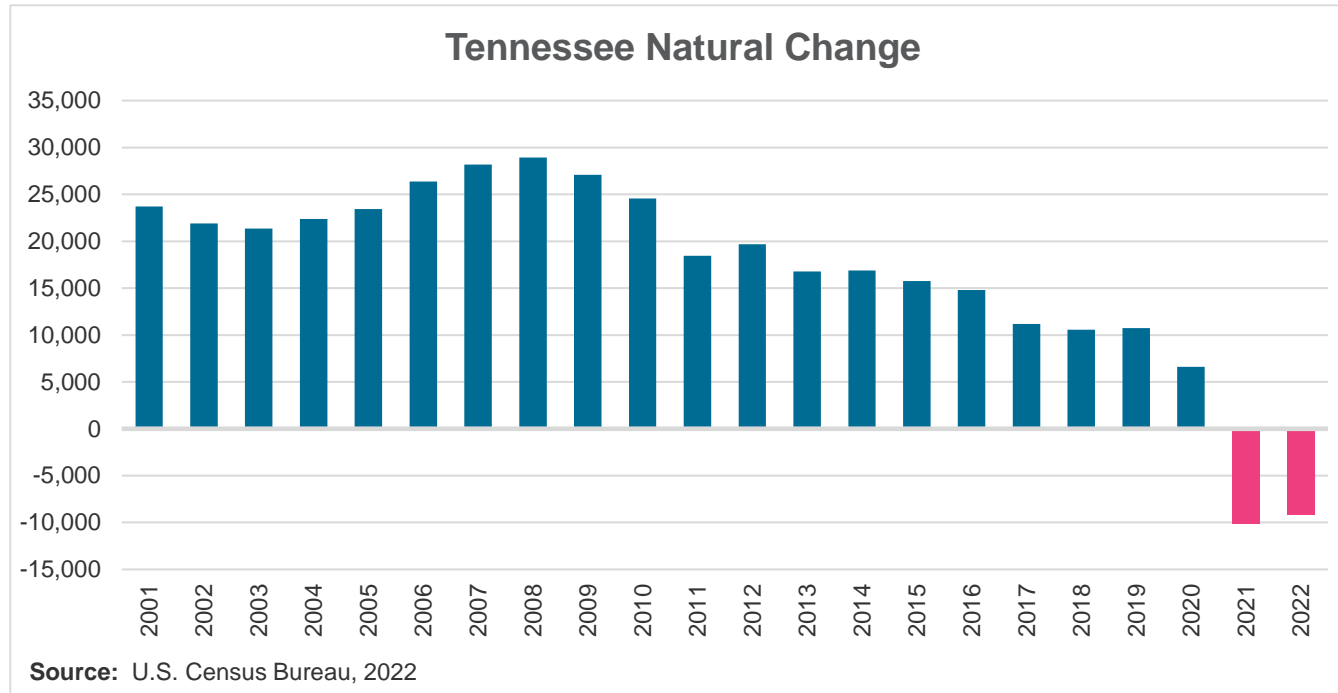
30-34: +38.6%

Aging population has pushed the number of deaths steadily upwards



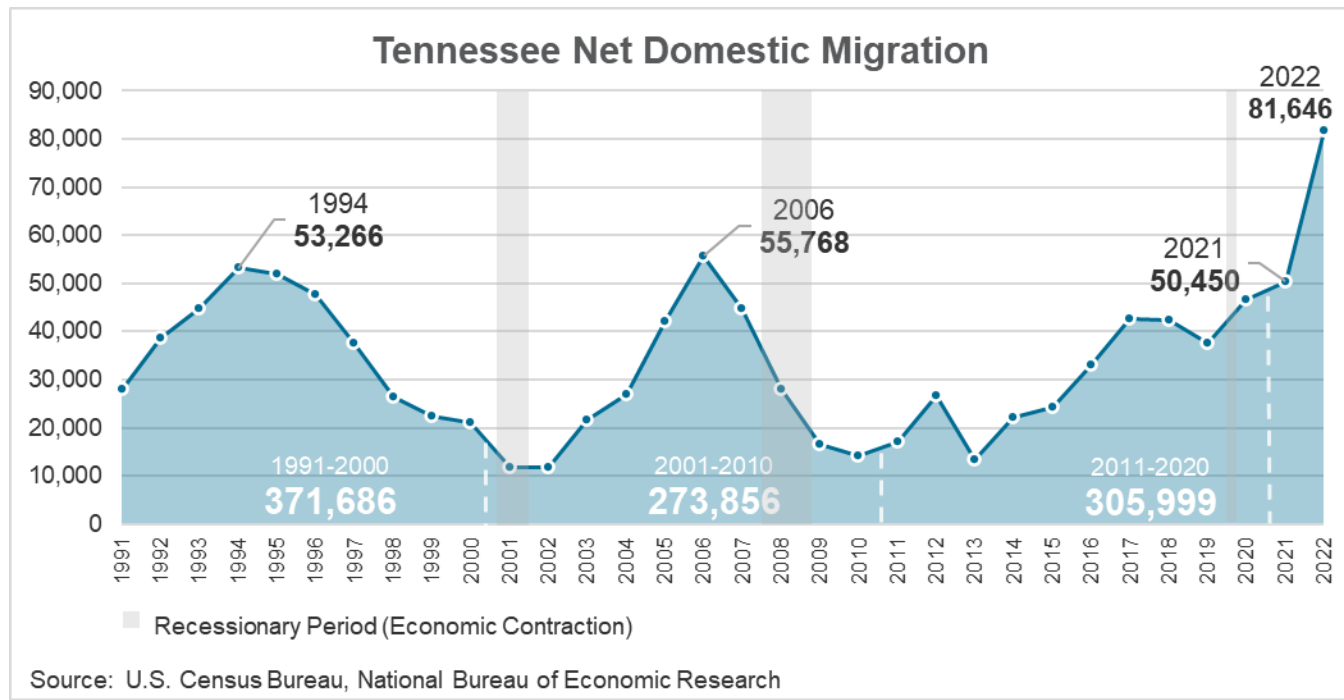
- COVID-related deaths spiked in 2020 and 2021

Natural decreases may be unprecedented but were a likely eventuality



- 24 states had a natural decrease in 2022
- Just eight of 95 counties had a natural increase in 2022

Procyclical migration patterns could mean less predictable population changes



- Single-year high in 2022
- Economic downturns coincide with migration slowdowns

Interstate mover rates grew from 2.9% in 2019 to 3.2% in 2022, but other move types fell

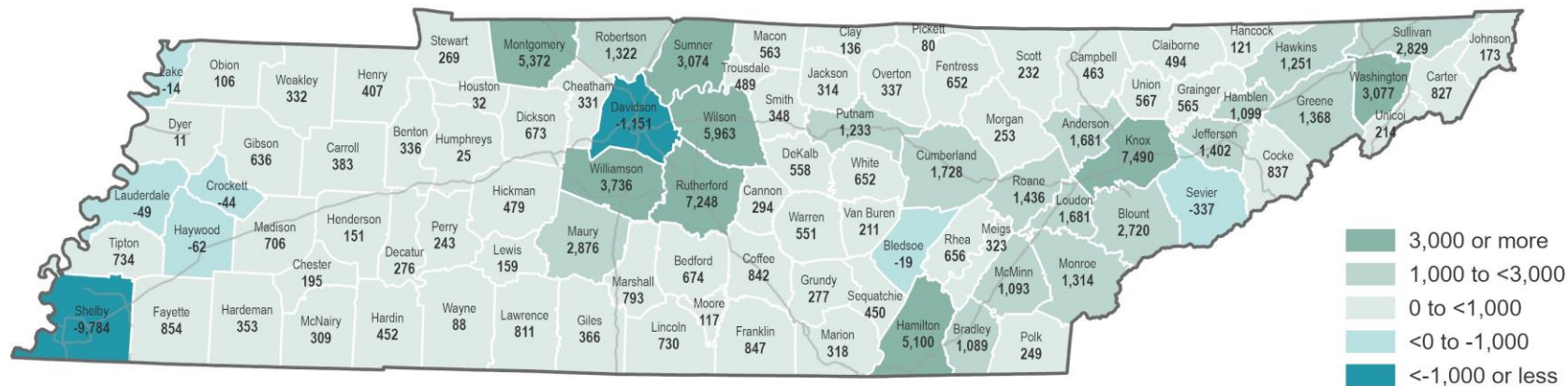
State	Region	2019
Florida	South	21,539
Texas	South	15,068
North Carolina	South	13,551
Georgia	South	12,668
Mississippi	South	12,011
California	West	11,874
Kentucky	South	11,500
Illinois	Midwest	8,607
Virginia	South	8,040

State	Region	2022
Florida	South	25,318
California	West	22,565
Georgia	South	14,770
Texas	South	12,862
Illinois	Midwest	12,602
Mississippi	South	9,491
Virginia	South	9,450
Alabama	South	9,375
Kentucky	South	8,227

Source: American Community Survey, State-to-State Migration Flows

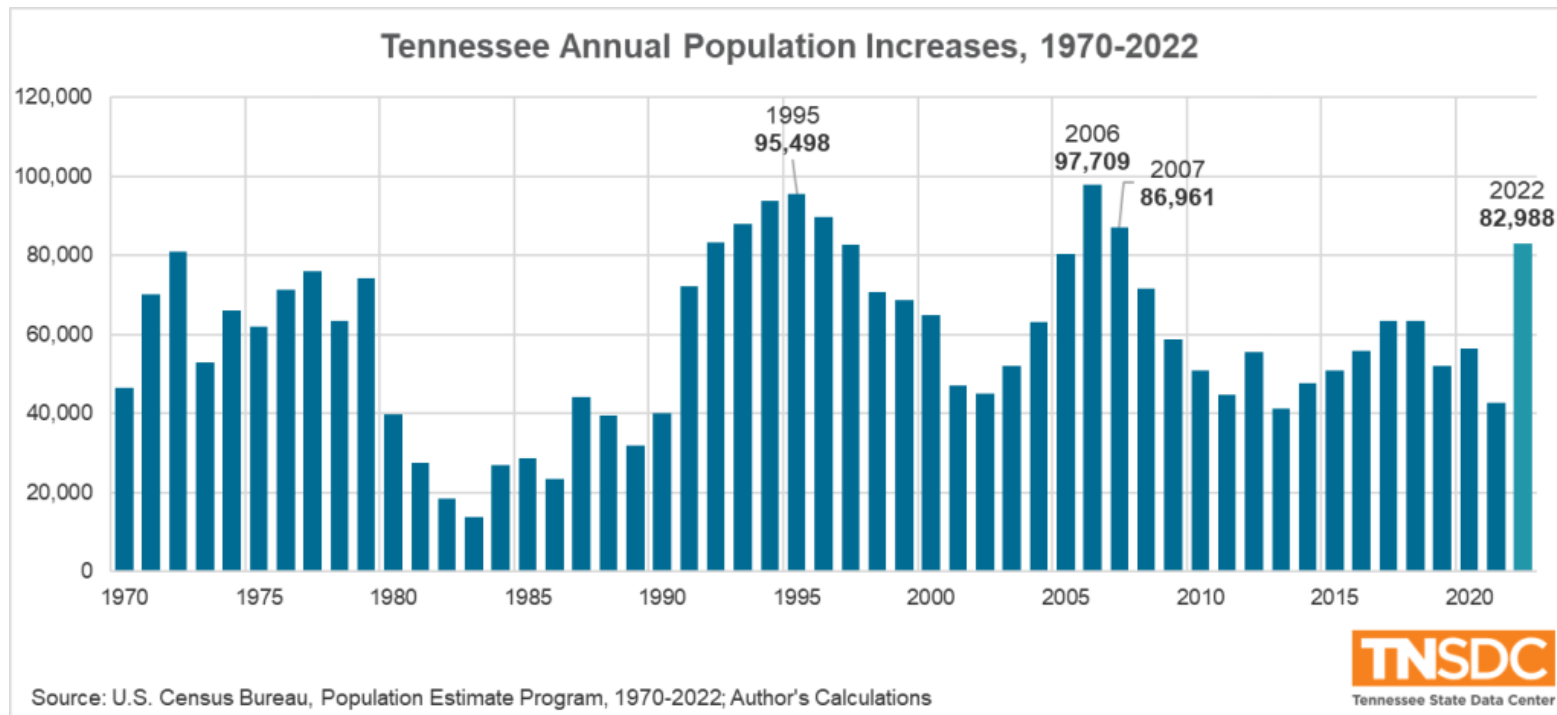
87 counties had positive net domestic migration in 2022

Net Domestic Migration in Tennessee, 2021 to 2022



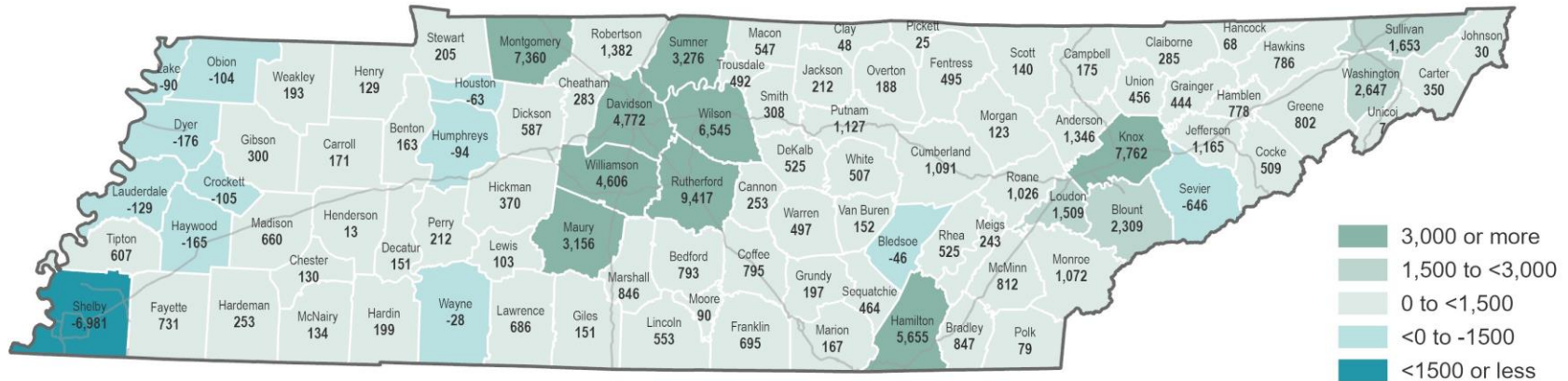
Source: U.S. Census Bureau Population Estimates, 2022

1.2 percent one-year increase was the largest since 2007 and eighth largest in state history



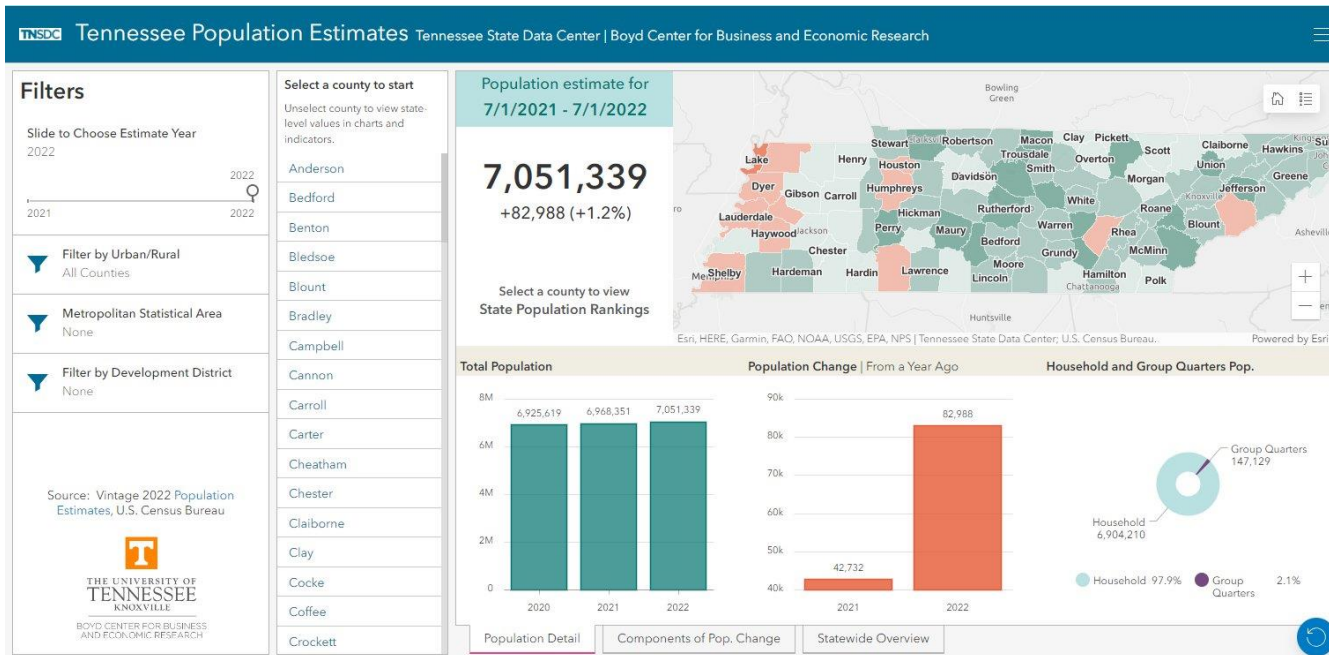
Widespread increases included population gain in 68 of Tennessee's 78 rural counties

Population Change in Tennessee, 2021 to 2022



Source: U.S. Census Bureau Population Estimates, 2022

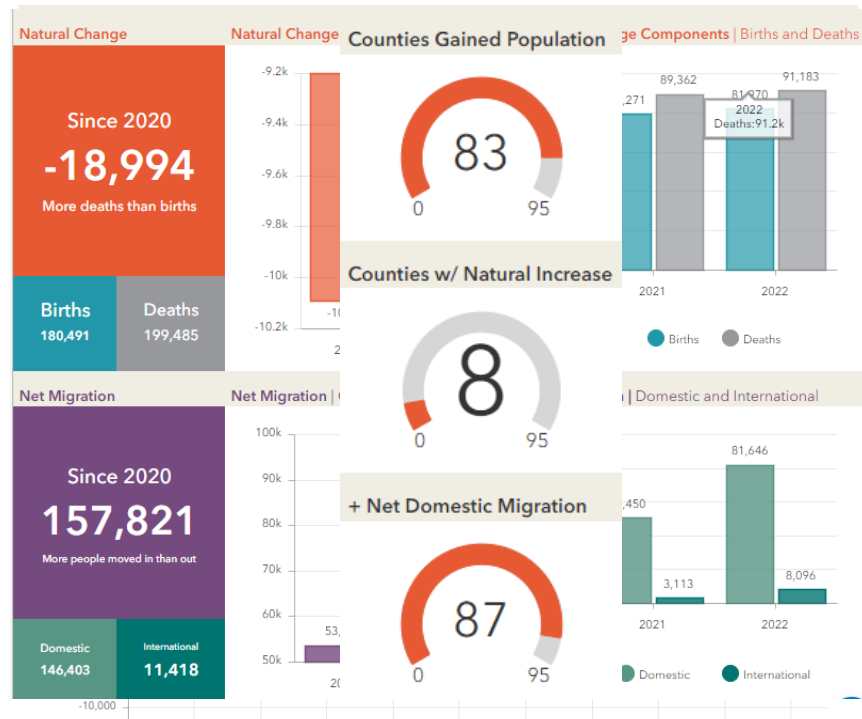
County Population Estimates and Components of Change Dashboard Launches



https://tiny.utk.edu/co_est_202x_dash

Top 4 Pop. Est. Dashboard Features

- Filters by Dev. Dist., MSA, Urban/Rural
- County Key Performance Indicators
- Fastest growing counties
- Components of change details

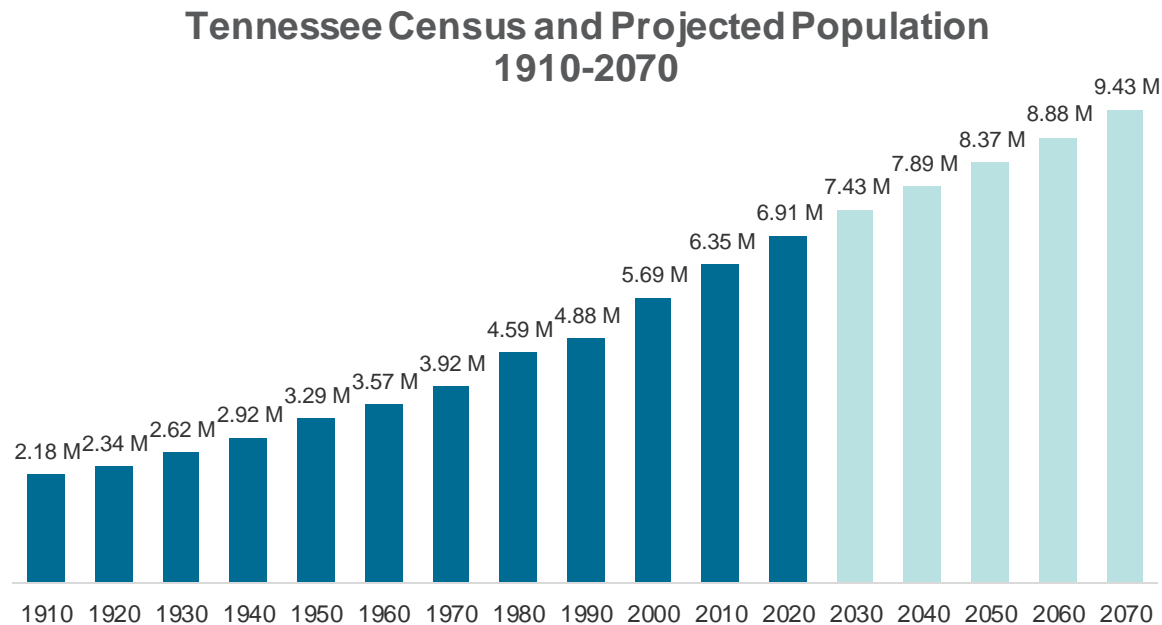


Peering into the future population changes in Knox County

BOYD CENTER POPULATION PROJECTIONS

2020-2070 Boyd Center Population Projections

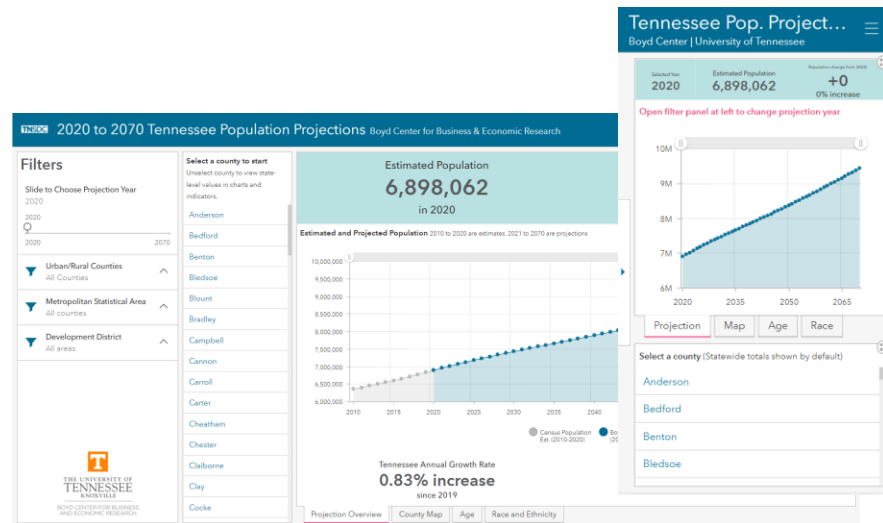
- Updated Biennially
- County-level



Source: AppointmentCounts, US Census Bureau, 2020, Boyd Center, 2022

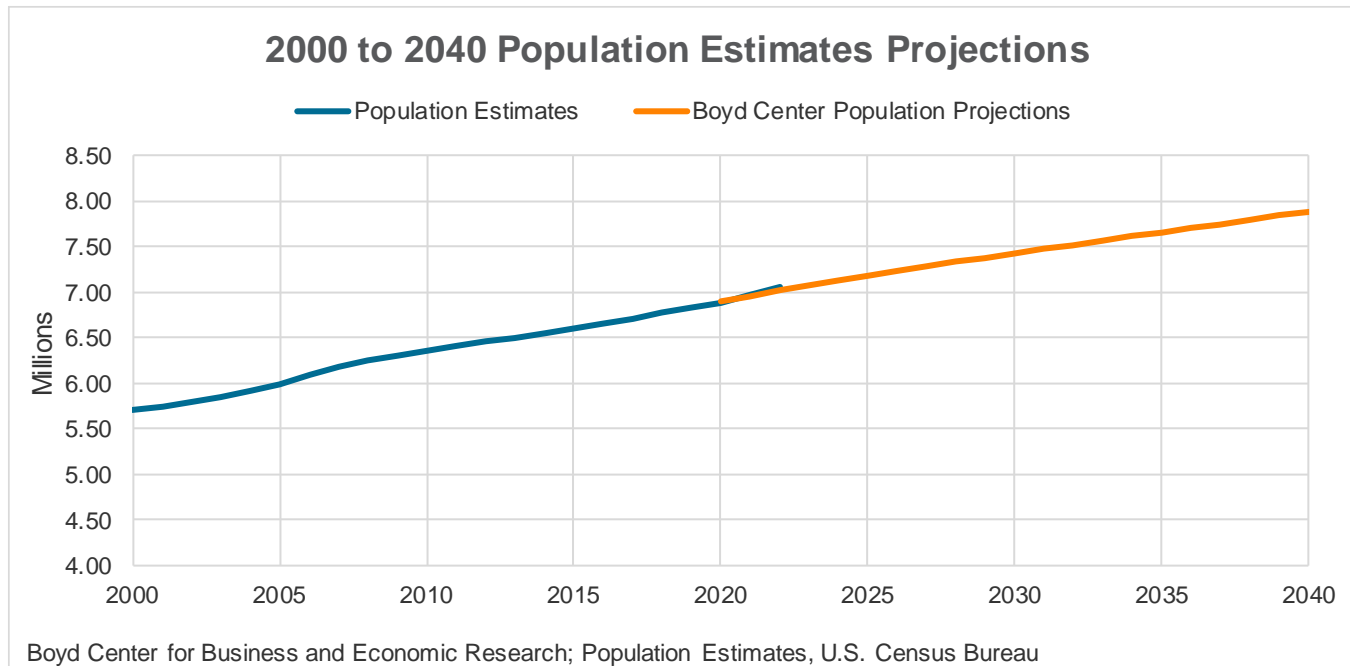
2020-2070 Boyd Center Population Projections

- Excel Workbook
 - Raw data
 - Summary-levels
- GIS formats
- Interactive dashboard



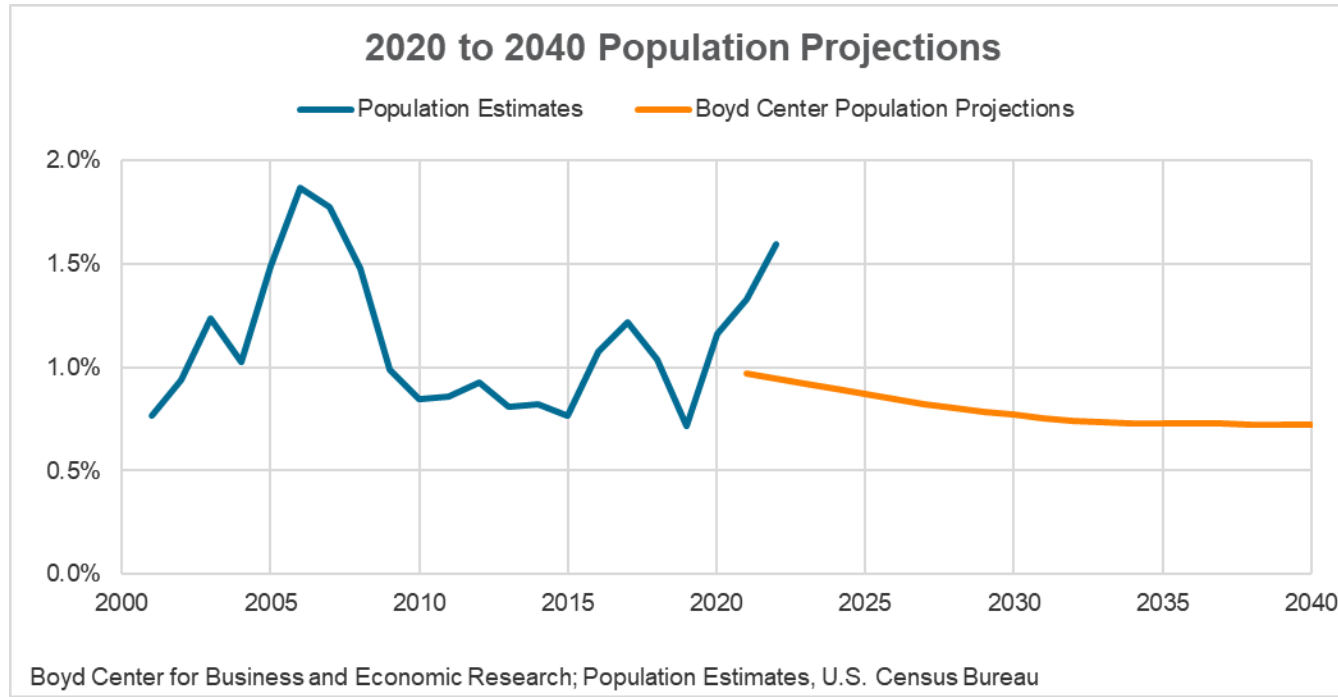
<https://tnsdc.utk.edu/estimates-and-projections/boyd-center-population-projections/>

Tennessee's population gains in 2020's will be similar to growth levels in the 2010's



Decade	Population Growth
2000-2010	651,799
2010-2020	531,316
2020-2030	530,589
2030-2040	459,399

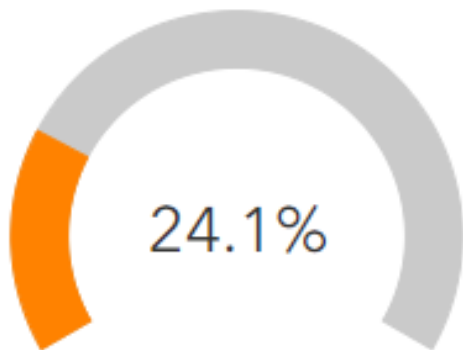
Annual growth rates will slow steadily over the next two decades



Decade	Annual Growth Rate
2000-2010	1.1%
2010-2020	0.8%
2020-2030	0.7%
2030-2040	0.6%

Tennessee Age Indicators (2040)

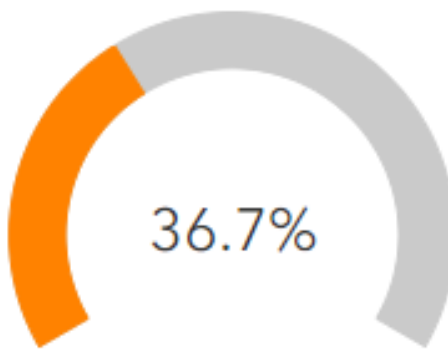
% Youth | <20 years old



1,902,777

+215,028 (13%) since 2020

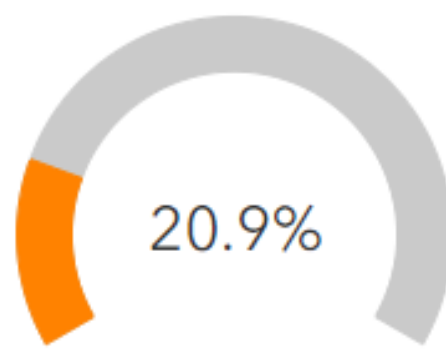
% Prime Working | Age 25 to 54



2,893,545

+212,958 (7.9%) since 2020

% Seniors | Age 65+



1,649,538

+468,077 (39.6%) since 2020

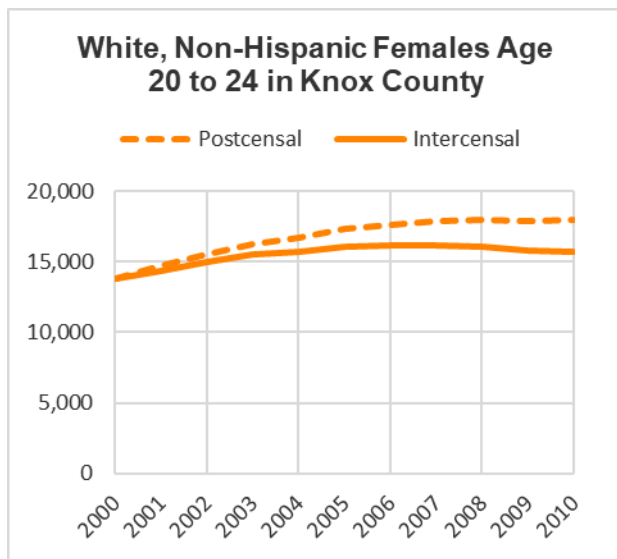
Total Increase: +989,976 (14.4%) since 2020

2023-2070 Projections Update

- Scheduled for Q1 2024 release
- Base data changes
 - Base period: 2010-2022
 - Tennessee 2010-2020 Intercensal Estimates (Boyd Center)
 - Latest postcensal estimate (Census Bureau, v2022) incorporating 2020 “blended base”

2010-2020 Intercensal Estimates

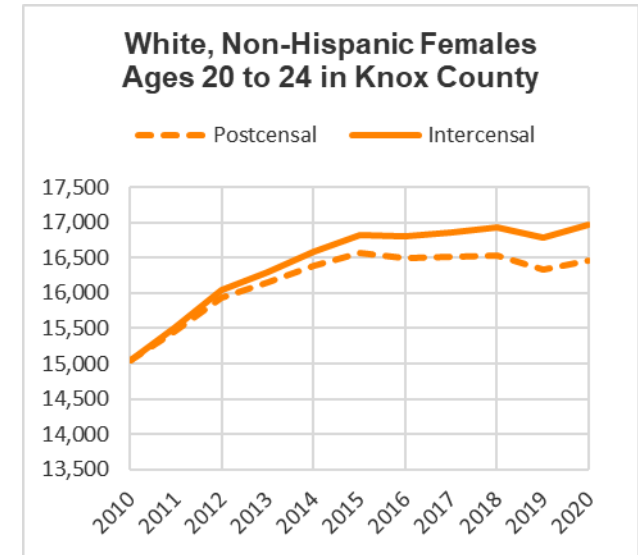
- Correct “error of closure” at 4/1/2020 between:
 - Decennial census
 - v2020 Population estimates
- Spread error evenly over the decade using a formula that assumes a constant rate of error correction
- Census product delayed until at ~Q3 2024



Source: U.S. Census Bureau

2010-2020 Boyd Center Intercensal Estimates

- County-level
- Characteristics compatible with projections
 - 5-year age groups (18)
 - Sex (2)
 - Race/Hispanic origin (4 groups)
- Source:
 - v2020 Evaluation estimates
 - Connected directly to 7/1/2020
- Updated biennially with projections

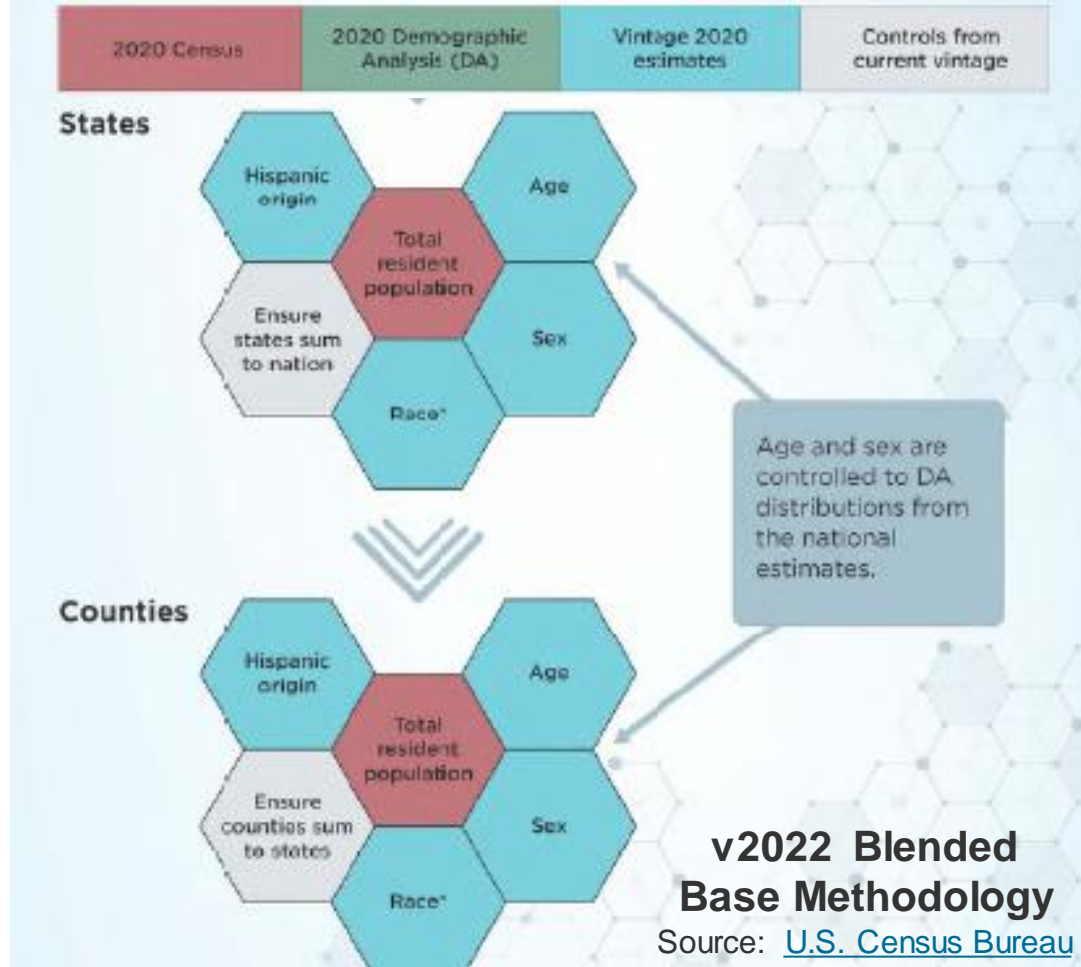


Source: U.S. Census Bureau

Vintage 2022 Blended Base for April 1, 2020

- Decennial census population for 4/1/2020
- All other characteristics from v2020 Population Estimates

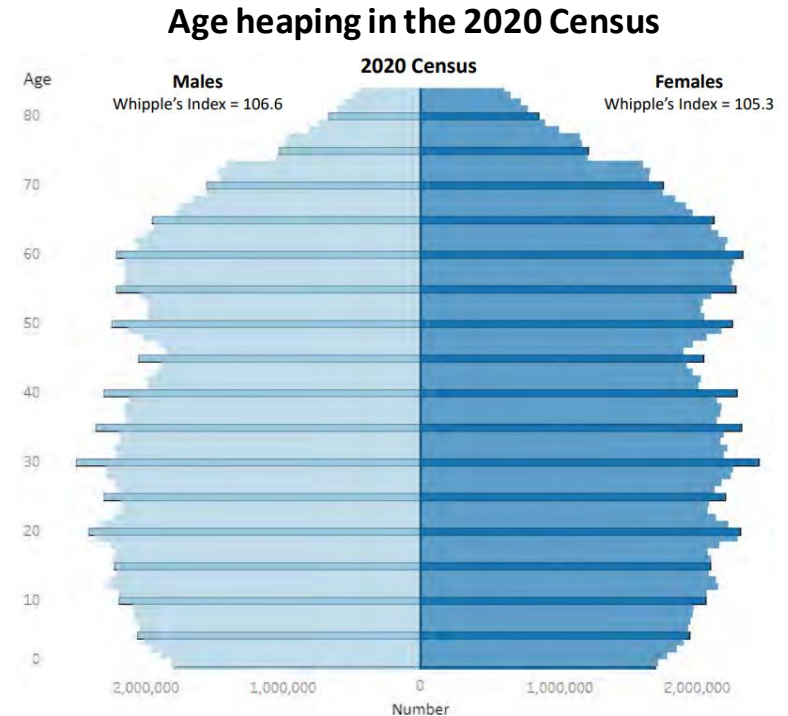
Decennial census typically forms the estimates base but required data from 2020 still unavailable.



Census Bureau research to address 2020 Census quality make July 1, 2020 population a moving target

Expected changes to 2020 base pop.

- Post Census Group Quarter Reviews
- Incorporate race/ethnicity results from 2020 Census (vintage 2024)
- Base Evaluation Research Team
 - Address “age heaping”
 - Completeness of Hispanic origin counts
 - Post Enumeration Survey results



Major Questions for 2023-2070 Population Projections

Migration – Change in base year to 2010 has migration trough to peak (no cycle, end on record high).

Do we need to intervene and forecast migration cycle?

Deaths – Fell back to 2020 levels after jumps in 2020 and 2021. **Is COVID a structural change in deaths or is it transitory?**

Fertility – Births grew over last two years but fertility rates turned down. **Is this a return to trend?**

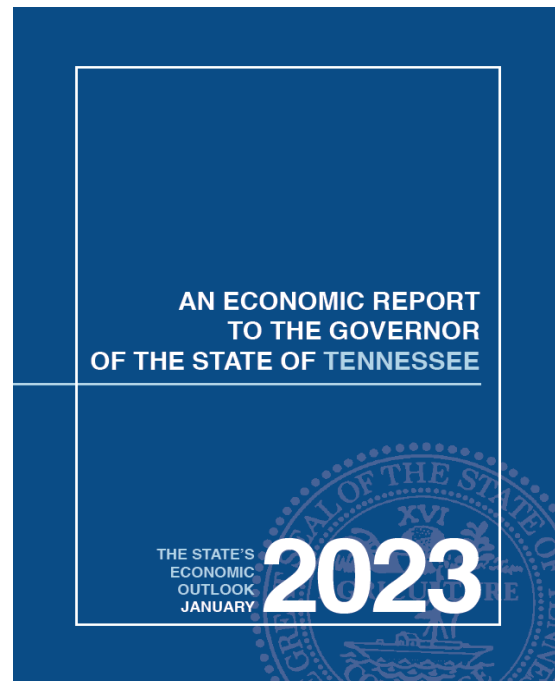
2022 was bonkers. Is this the new normal or a one-time occurrence?

Some employment products that are probably too coarse for TDM

EMPLOYMENT DATA SOURCES

Boyd Center Forecast Data

- Included in Annual Economic Report to Governor
- 3-year quarterly and 10-year annual forecasts at state-level
 - Employment by sector
 - Manufacturing employment (durable/non-durable)
 - Labor Force, Unemployment
 - GDP, Taxable Sales



[Download](#)

Confidentiality Protections in Federal Law Mean Disclosure Avoidance is a High Priority

- Title 13 protections limit utility of federal data for high-resolution TDM applications

“Title 13 provides the following protections to individuals and businesses:

Private information is never published. It is against the law to disclose or publish any private information that identifies an individual or business such, including names, addresses (including GPS coordinates), Social Security Numbers, and telephone numbers.”

Census Employment Data by Geographic Scale

Block	Tract	Zip Code	Place	County
LODES <ul style="list-style-type: none"> • Workplace • Residence • Origin-Destination 	ACS <ul style="list-style-type: none"> • Primarily place of residence 	Zip Code Business Patterns	Economic Census	County Business Patterns
			Local Area Unemployment Statistics (BLS)	Non-Employer Statistics
				Center for Econ. Studies <ul style="list-style-type: none"> • Bus. Dyn. Stat. • Quarterly Workforce Ind.

LEHD Origin-Destination Employment Statistics (LODES)

- Block-level data
- Covers 2002-2020
- Data from Labor Market Information Offices in 47 states
- Record linkage between establishment and employee
 - Quarterly Census of Employment and Wages (QCEW)
 - Unemployment Insurance (UI)

Details of LODES files

Residence Characteristics

- Jobs
- Jobs by workers earnings
- NAICS Sector (2-digit)
- Age, race, sex, education attainment

Workplace Characteristics

- Jobs
- Jobs by workers earnings
- NAICS Sector (2-digit)
- Age, race, sex, education attainment
- Firm age and size

Origin-Destination (Workplace-Home)

- Jobs
- Jobs by workers earnings
- Coarse emp. Sectors
- Age

Articles from the State Data Center

SOME LIGHT READING ABOUT TENNESSEE POPULATION AND ECONOMY

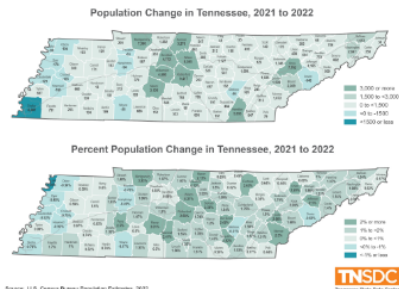
On the TNSDC Website: Population Estimates and Other Census Releases



2022 Population Estimates Show Big Cities on the Move in Tennessee

MAY 18, 2023

If 2021 was the year of the small city, 2022 was the year of the large metro in Tennessee. The state's biggest communities lead population increases last year. We dig in on the new Vintage 2022 Population Estimates for cities and towns released on May 18th.



2022 County Population Estimates: Most Metros Swell, Rural Tennessee Counties See Upswing

APRIL 5, 2023

Most Tennessee counties had a population increase last year. Record levels of domestic migration have even slowed rural population losses. We took a closer look at where the big changes were in 2022 and how the numbers look across the rest of the state.



Breaking Down the 2022 Population Estimates: What Drove Tennessee's Big Gain Last Year?

MARCH 14, 2023

The southern U.S. saw big population gains last year and so did Tennessee. 81,646 more people moved into the state than moved out of it - a record-level of domestic net migration.



New Census Estimates Show Nashville-Davidson County Population Decrease in 2021

MARCH 24, 2022

Did Nashville lose population last year? 2021 Population Estimate data from the US Census Bureau show that Davidson County, which is centered in fast-growing Middle Tennessee, ceded some of the 90,000 people it gained between 2010 and 2020. We take a close look at the numbers.

On the TNSDC Website: Broad Economic and Demographic Trends in State



Tennessee's Growing Retirement-Age Population Outshines Increases Among Prime-Age Workers

SEPTEMBER 12, 2023

Seniors remain Tennessee's fastest growing age group, but the pace has picked up for the state's prime working-age population over the past two-years. We examine some recent trends that could positively impact the state's labor force.



Employment Is Growing for Tennessee Teens but Jobs Are Still Less Common

JUNE 8, 2023

12 percent of Tennessee teens age 14 to 18 had a job in 2010. That number has almost doubled in the last few years and employment for the group is at its highest level in more than two decades. Read our breakdown - summer jobs, employment sectors and earnings for the state's teens.



Tennesseans Paid 9 Percent Less For Goods and Services than US Average

JANUARY 24, 2023

Although inflation grew sharply in 2021, prices in Tennessee were below the national level. The cost of goods, services and housing were 9.1 percent under the U.S. average. Updated regional price data also shows how affordability of the state's metro areas breaks down.



2021 Data Show Bump in Births, Rise in Deaths in Tennessee

FEBRUARY 27, 2023

Tennessee saw an unexpected increase in the number of births in 2021. It also saw a jump in the number of deaths. In different ways, both events were affected by the COVID-19 pandemic. We take close look at what changed in the first two years of the decade.

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