

Tennessee Population Projections and Underlying Influential Trends

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Demographic Data - Sources

- Decennial Census
- American Community Survey
- Census Bureau Population Estimates
- Population Projections

Decennial Census

- Mandated by Article 1, Section 2 of U.S. Constitution
- Based on actual counts of persons
- Used to determine number of members in House of Representatives from each state
- Provides the base population for the annual population estimates series

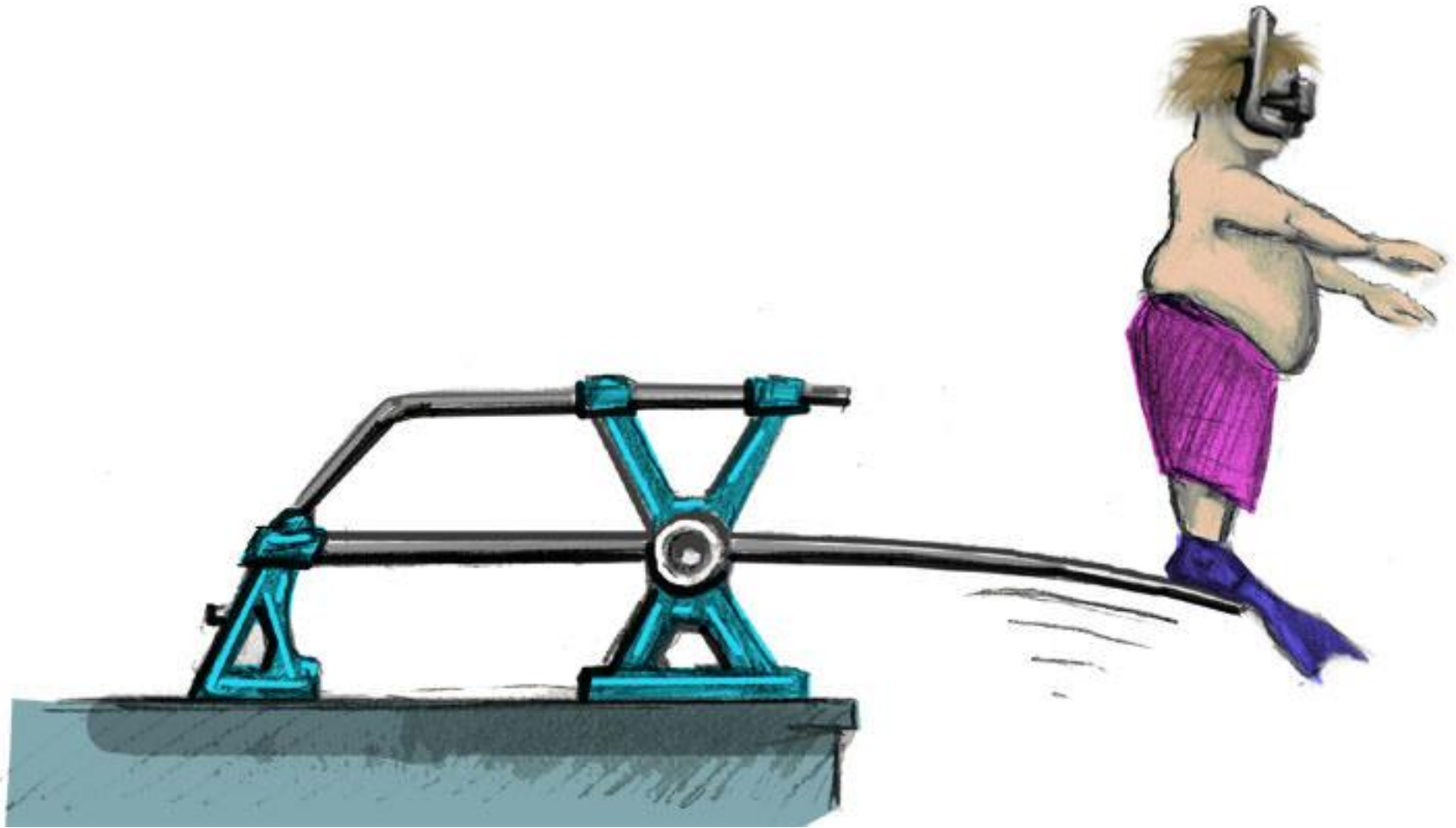
Population Estimates

- Calculated number of people living in an area at a specific point in time.
- Derived using models that account for changes in:
 - Births
 - Deaths
 - **Net Migration**
- Used to control/inform ACS, CPS, etc.
- Used for denominators by state/local government agencies and non-profits as denominators in rate calculations and program fund allocations.

Population Projections

- Estimates of the population for future dates
- Relies on assumptions about future births, deaths, and net migration.
 - Big one – that future data will follow some version of prior trends.
- Used by government, business, and non-profits for planning purposes and demand forecasts.

Where are we now?



What We Did (starting 2017)

- A 'cohort-component' model
 - 5-year Age – Sex – Race/Ethnicity - County
- Birth: county-age-race specific birth rates
- Death: Statewide death rates, augmented by SSA tables for changing life-expectancy.
- Net Migration – About that . . .

Invisible Forces

- Net Migration is Unobservable
 - Birth and death are documented in vital statistics ‘Tennessee Department of Health’
 - Net migration is the ‘residual’
 - Population is known
 - Births are known
 - Deaths are known
 - Net Migration makes up the difference
- Most volatile component of population change
- Most critical component of short-term population change.
- Also is the main reason why taking population dynamics is important for a good forecast.
 - It’s not just about *if* people are moving to a county, but *who* is moving to a county that affects future pop.

Nitty Gritty on Net Migration

- Use race, age, 5-year age band population estimates by county from 2000-2018.
- Use SSA life tables to project the number of survivors for each.
- Add the births from TDH/VSS to the 0-4 group.
- Use decennial census info on distributions of within-age bands to determine the proportion of each band to age into the 'next band.'
- The difference between the actual and observed population in 't+1' is the net migration. The average net migration from 2000-2018 is used as the baseline expectation of net migration going forward.

TN Doing What TN Does

- From a population standpoint:
 - Grow at about 1.0% per year on average
 - Noisily
 - 1930's – 11.4% Growth
 - 1940's – 12.9% Growth
 - 1950's – 8.4% Growth
 - 1960's – 10.0% Growth
 - 1970's – 17.0% Growth
 - 1980's – 6.2% Growth
 - 1990's – 16.7% Growth
 - 2000's – 11.5% Growth
 - 2010's – 8.3% Growth (at current pace)

The Impact of Five Counties (or, Marcia, Marcia, Marcia)

Population

Year	Tennessee	Share of State	TOTAL	Davidson	Rutherford	Williamson	Wilson	Sumner
2016	6,770,010	0.2330	1,576,980	692,587	324,890	231,729	140,625	187,149
2010	6,346,105	0.2123	1,347,105	626,681	262,604	183,182	113,993	160,645
2000	5,689,283	0.1930	1,097,810	569,891	182,023	126,638	88,809	130,449
1990	4,877,185	0.1807	881,331	510,784	118,570	81,021	67,675	103,281

Change

2018- 2010	423,905	<u>0.5430</u>	229,875	65,906	62,286	48,587	26,632	26,504
2010- 2000	656,822	<u>0.3795</u>	249,295	56,790	80,581	56,544	25,184	30,196
2000- 1990	812,098	<u>0.2666</u>	216,479	59,107	63,453	45,617	21,134	27,168


Cohort Component Model

- We model population growth as a pure population process.
 - Births
 - Deaths
 - Historical Net Migration
- We do **NOT** include structural economic factors:
 - Structural Economic Changes
 - Planned Development
 - Infrastructure Changes

Why we exclude economic data

- To include economic data in a model, you need:
 - *Consistent* variables and consistent impact.
 - An issued commercial development permit has to **mean** the same thing in County X as it does in County Y.
 - Accurate forecasts of all economic variables included.
 - When accurate, including economic variables may be helpful.
 - Forecast error in economic variables may (and often does) make overall population forecasts less accurate.
 - Most economic variables are even noisier than net migration.
 - Incorporating them ALSO requires an understanding of *who* those variables bring in to a given county.
 - Population growth is actually a pretty stable process.

Key assumption 1

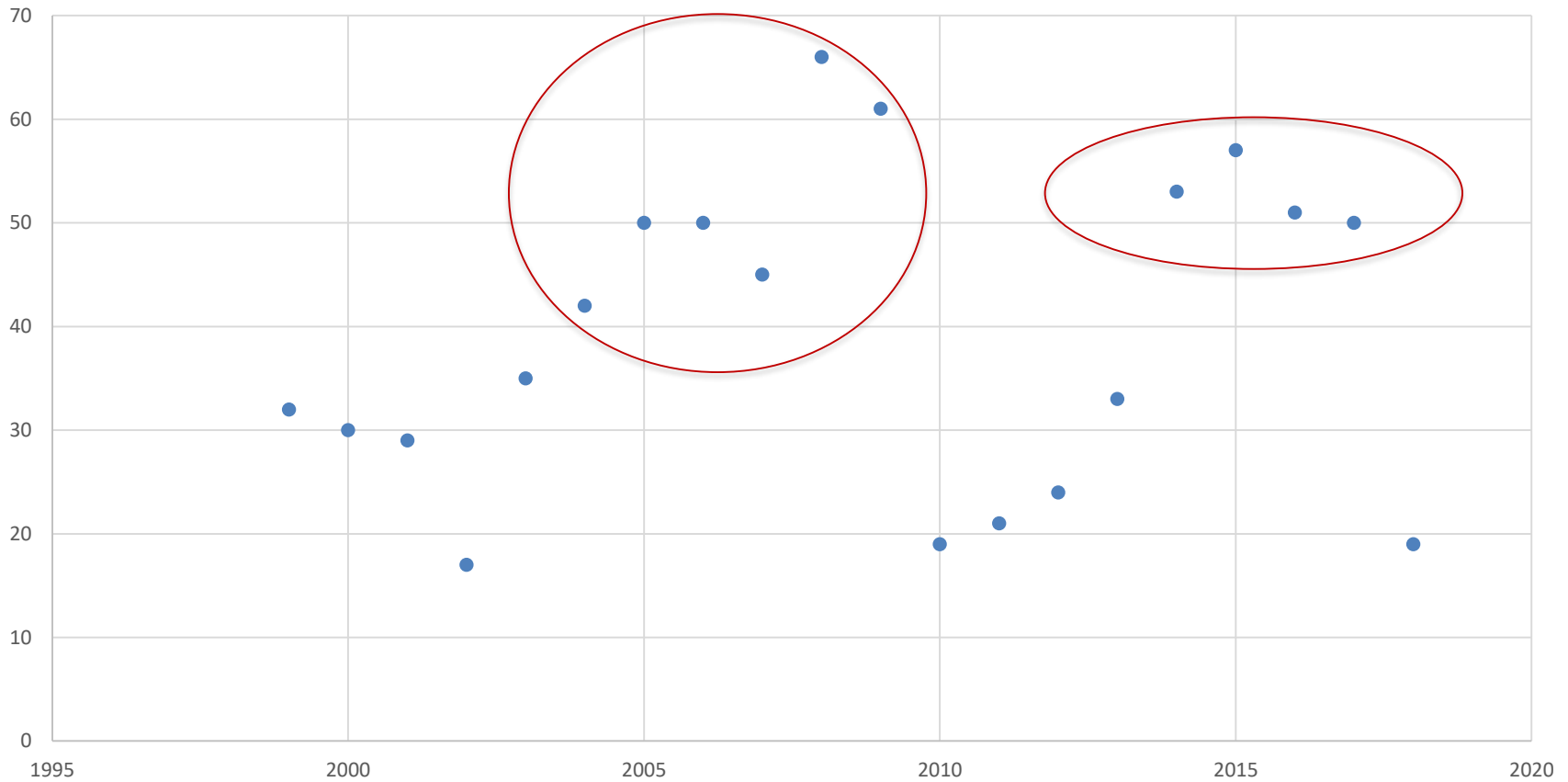


THIS HAS ALL HAPPENED BEFORE
AND IT WILL HAPPEN AGAIN

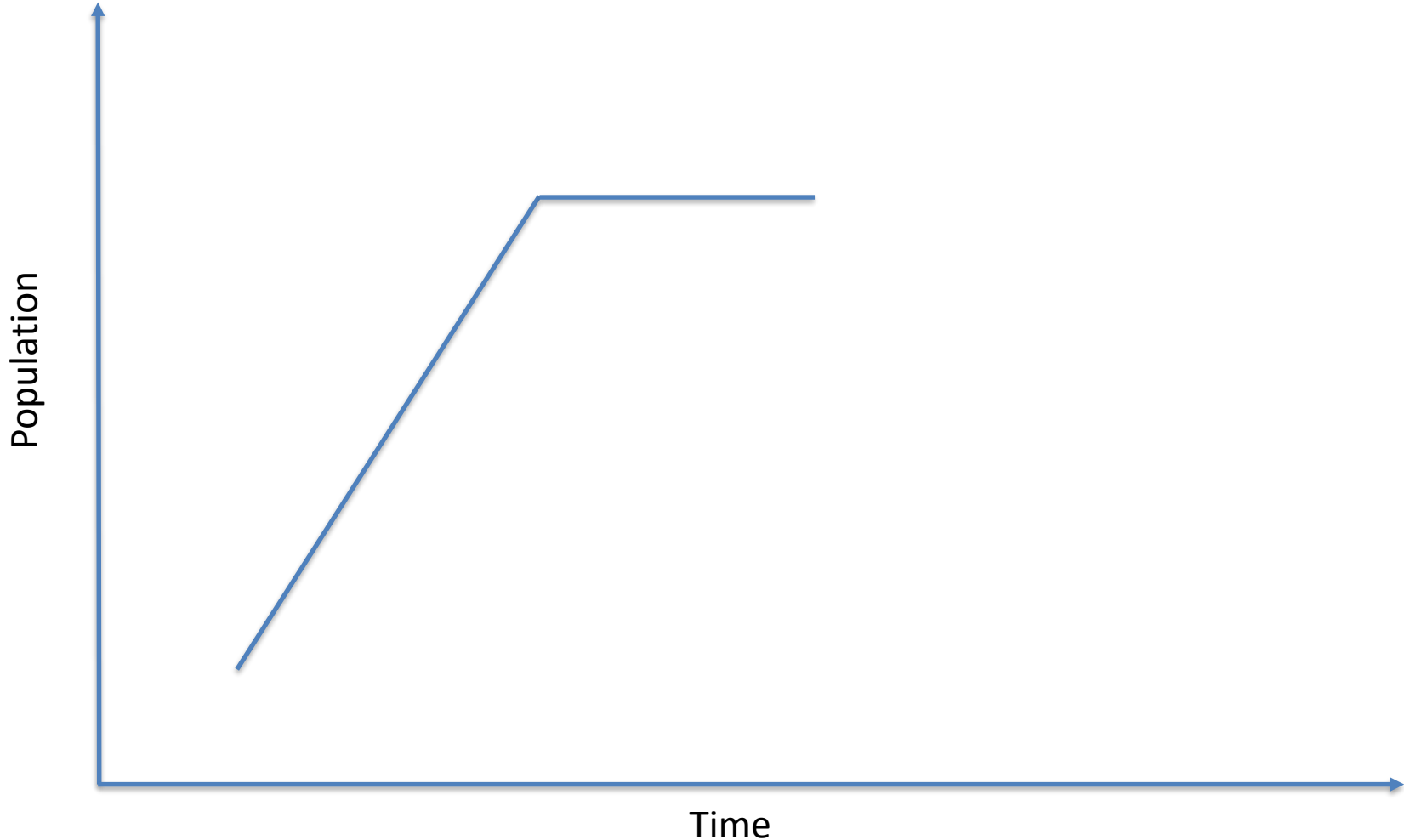
Key Assumption 2



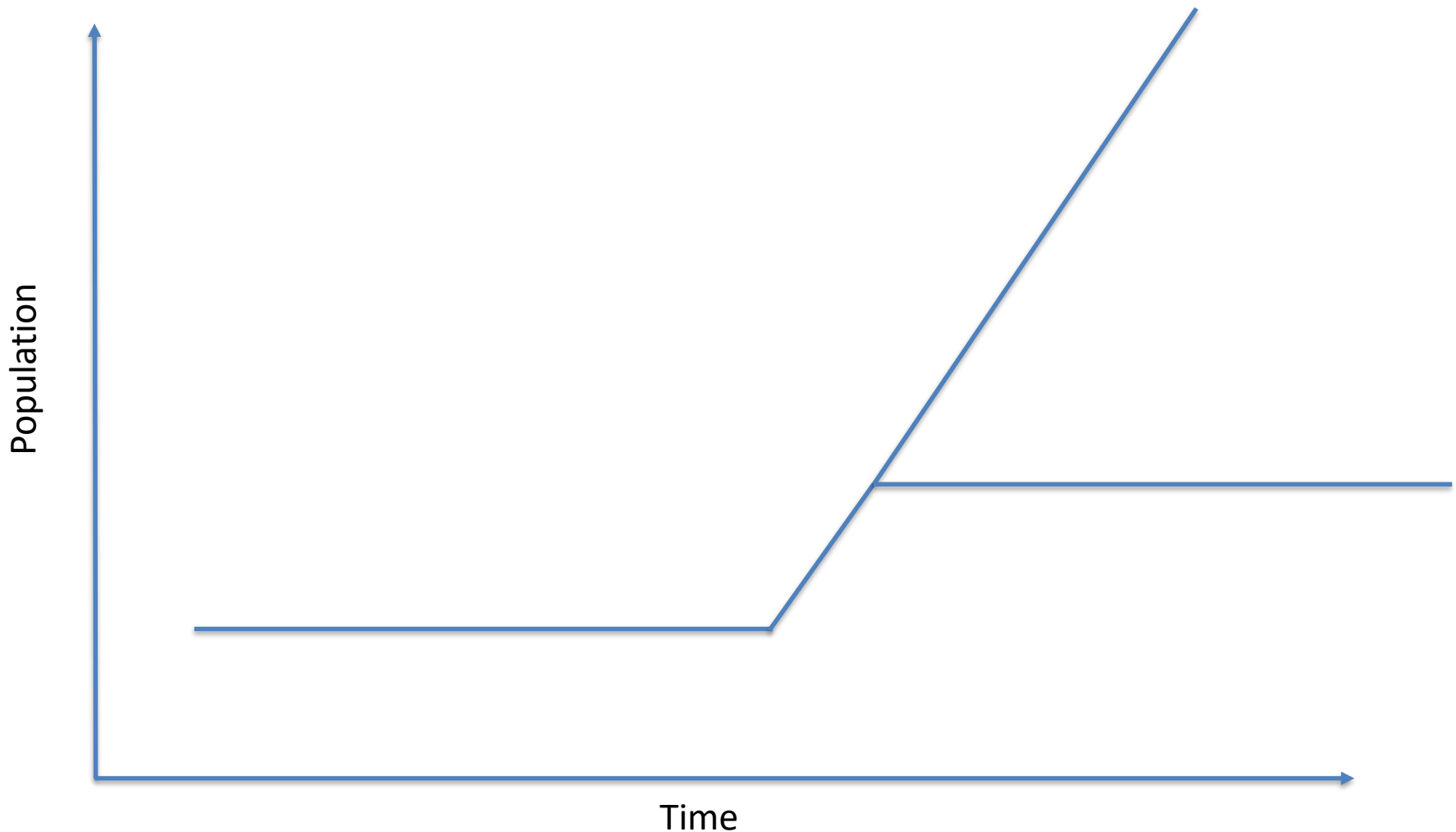
What's going to happen in 2019-2020



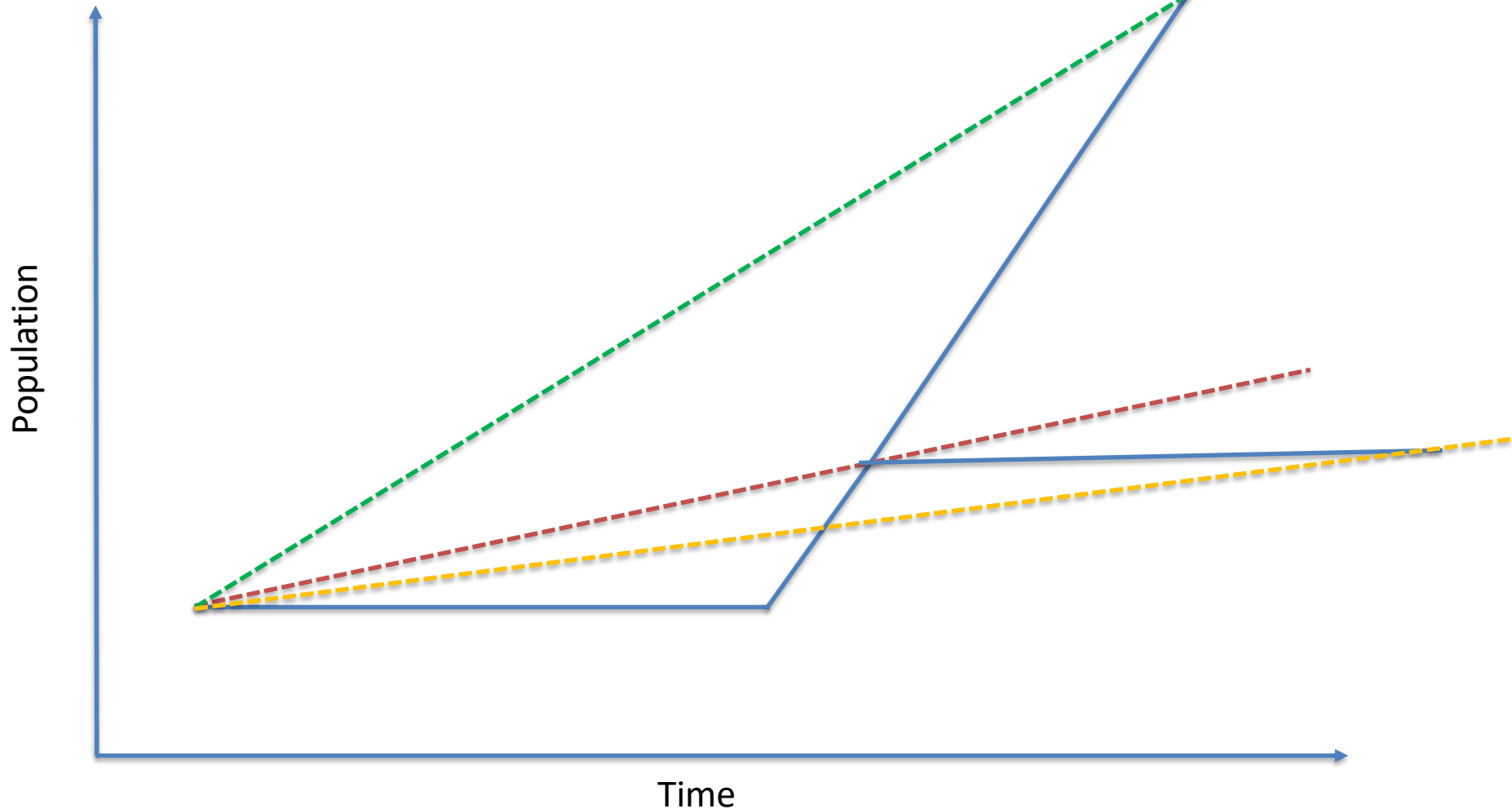
Challenge: knowing when/if there is a structural break



Forecasting across a (possible) structural break



Forecasting across a (possible) structural break



Well, how are we doing?

- Two years ago – projected pop was:
 - 6,769,368
- Most recent population estimate:
 - 6,770,010
 - Only 642 higher than expected.
 - This is crazy close.
 - We said the population would grow by 118,174
 - The population actually grew by 118,816
 - Over a two year window, our projected population growth was right to within half a percent.

How are long term projections changing?

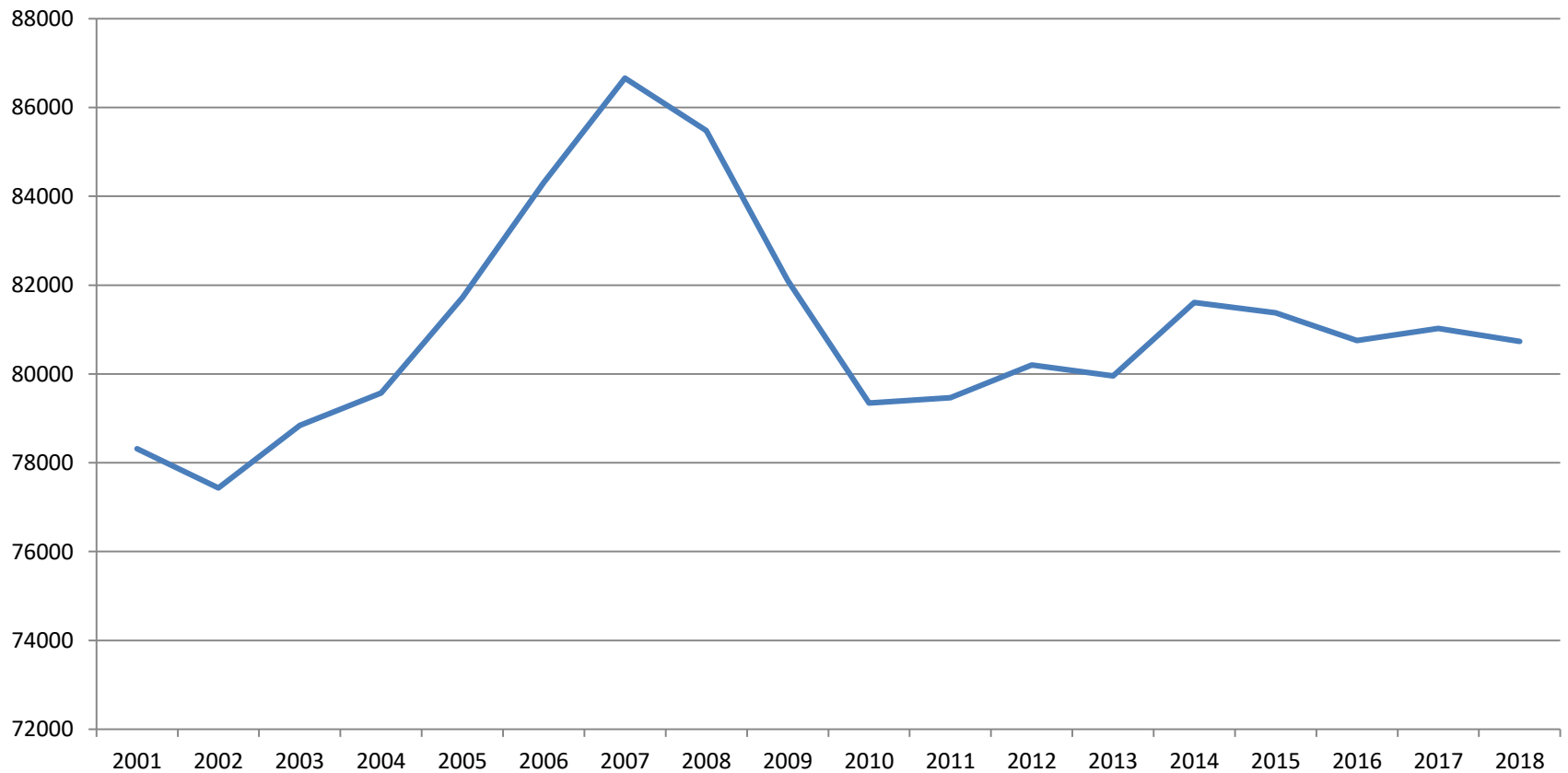
	2030	2040	2050
2017	7,390,535	7,853,224	8,341,055
2019	7,393,069	7,840,212	8,306,294
Change	2,534	13,012	34,761

These are small revisions. Even the 2015 number only implies 2.2% lower population change, total, over the next 30 years, or about .07 pct lower per year growth.

W&P's 2050 TN number fell by 640K over the last two years.

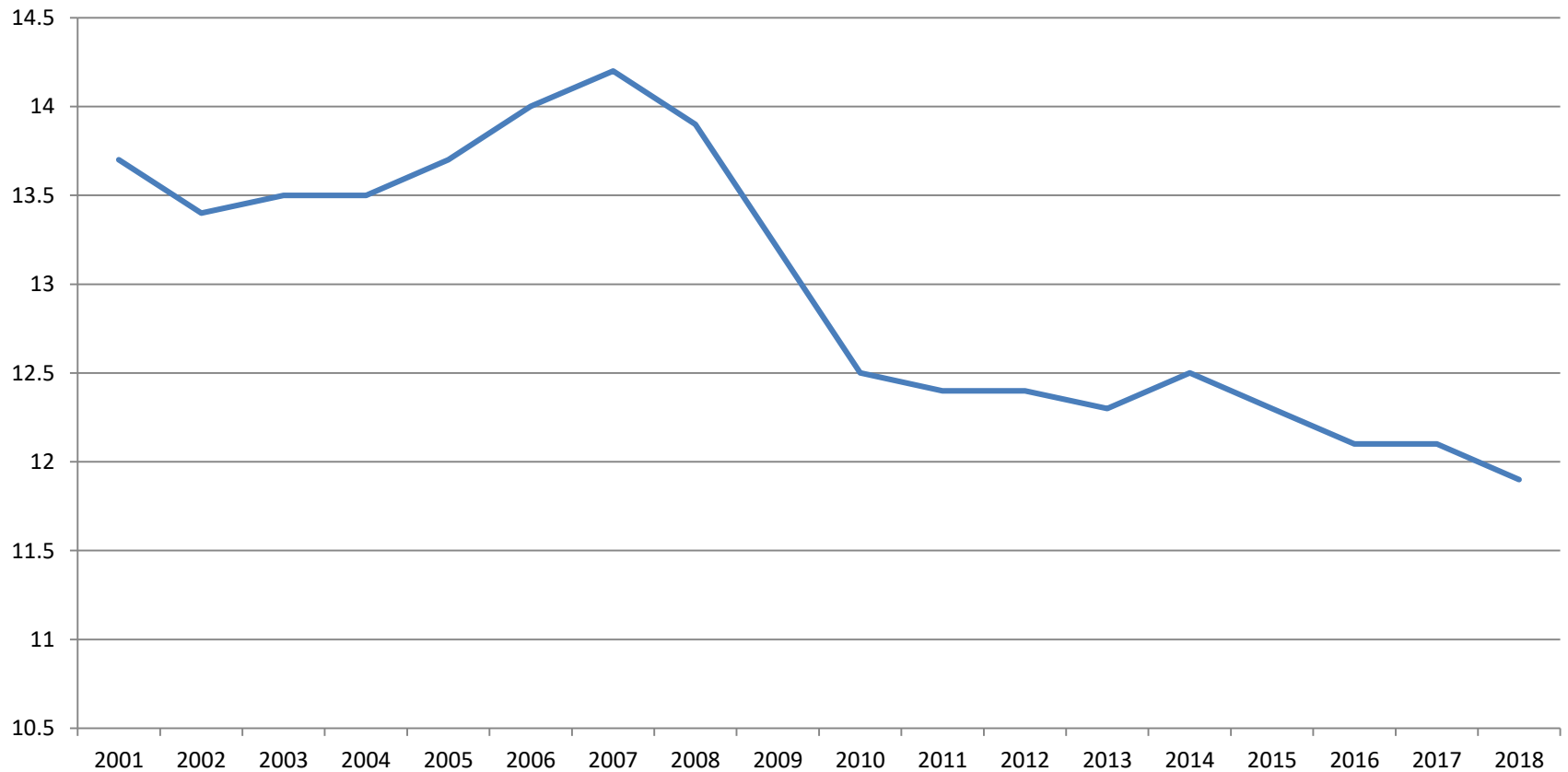
Births by Number

TN Live Births By Year



Birth Rates

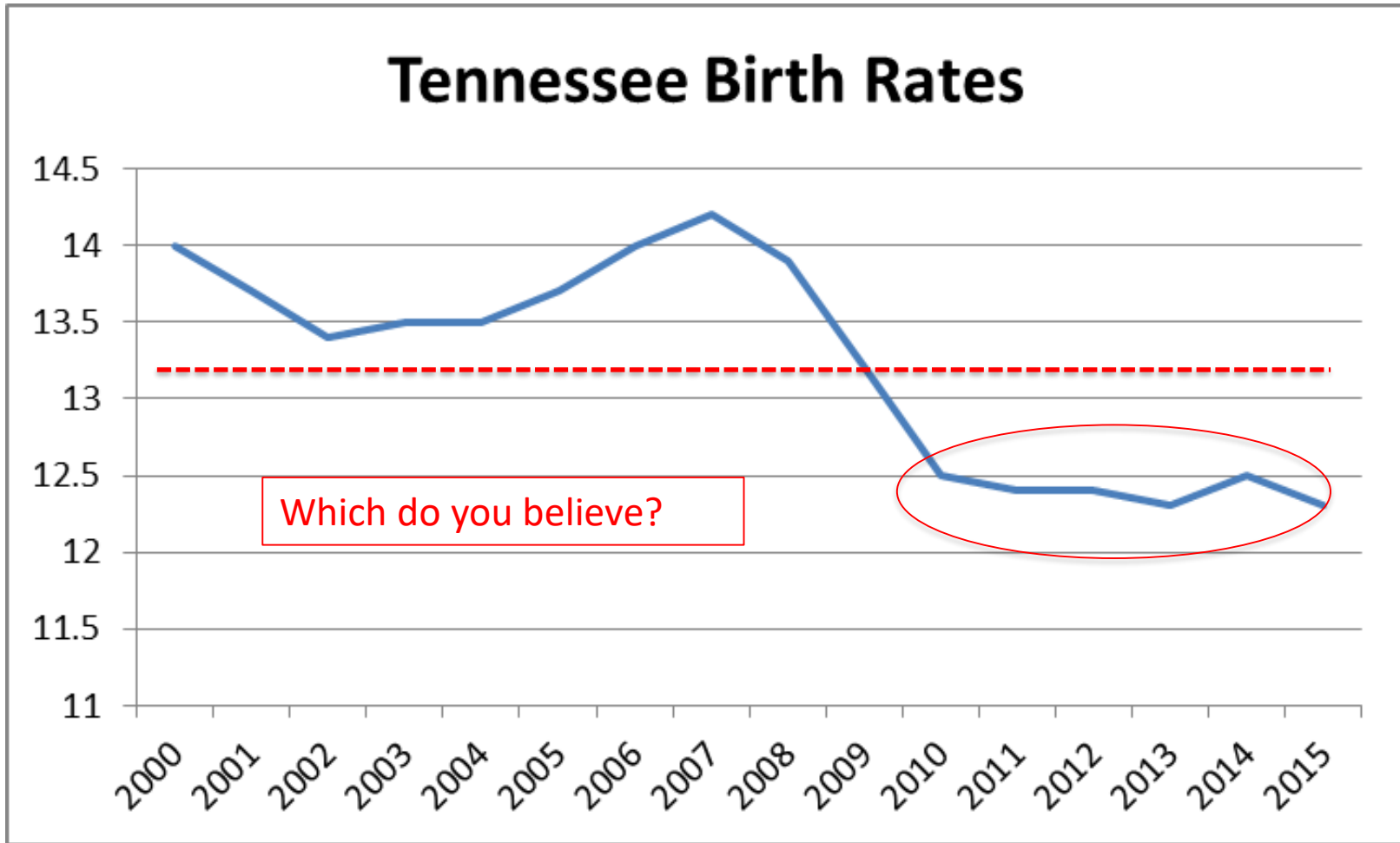
TN Birth Rates (per 1,000 pop) By Year



Births are falling everywhere

- 77 counties had fewer births in 2015 than in 2007
- Only 9 counties had higher birth *rates* in 2015 compared to 2007.
- 50 counties had fewer births in 2018 than in 2015

Birth Rates



Deeper into the Pattern

- Among the white non-Hispanic population, the drop is even more pronounced.
 - Since White non-Hispanics are about 73.5% of the population . . .
- Falling birth rates are a national and global trend.
- Also, considerations for how births are classified – by race of *mother* or race of *child*.
 - Leads to some strange ‘net migration’ patterns among children.

Natural Change – big picture

- 2007:
 - 86,661 Births
 - 56,800 Deaths
 - Natural Change: 29,861
- 2015:
 - 81,374 Births
 - 66,329 Deaths
 - Natural Change: 15,045
- 2018:
 - 80,735 Births
 - 71,055 Deaths
 - Natural Change: 9680

How pervasive is shrinking NC?

- 2007: Births > Deaths in 70 counties
- 2015: Births > Deaths in 34 counties
- 2018: Births > Deaths in 24 counties

- From 2015-2018, Natural change decreased in 70 of 95 counties.
- In 89 of 95 counties, natural change is negative or decreasing.

An aging domestic in-migrant population

- Number moved to TN from another state:
 - 2011: 171K
 - 2015: 196K
 - 2018: 209K
- 2011 – 34,600 kids in-migrated; 23,271 individuals aged 55 & up.
- 2018 – 39,254 kids in-migrated; 38,112 individuals aged 55 & up.
- 2015-2018: Individuals aged 55+ account for 60% of the increase in in-migration.
- Since 2011, the number of individuals aged 55+ moving to TN has increased by 64%.
 - The number of 18-24 year olds has decreased by 8%
 - The number of 25-39 year olds has only increased by 29%

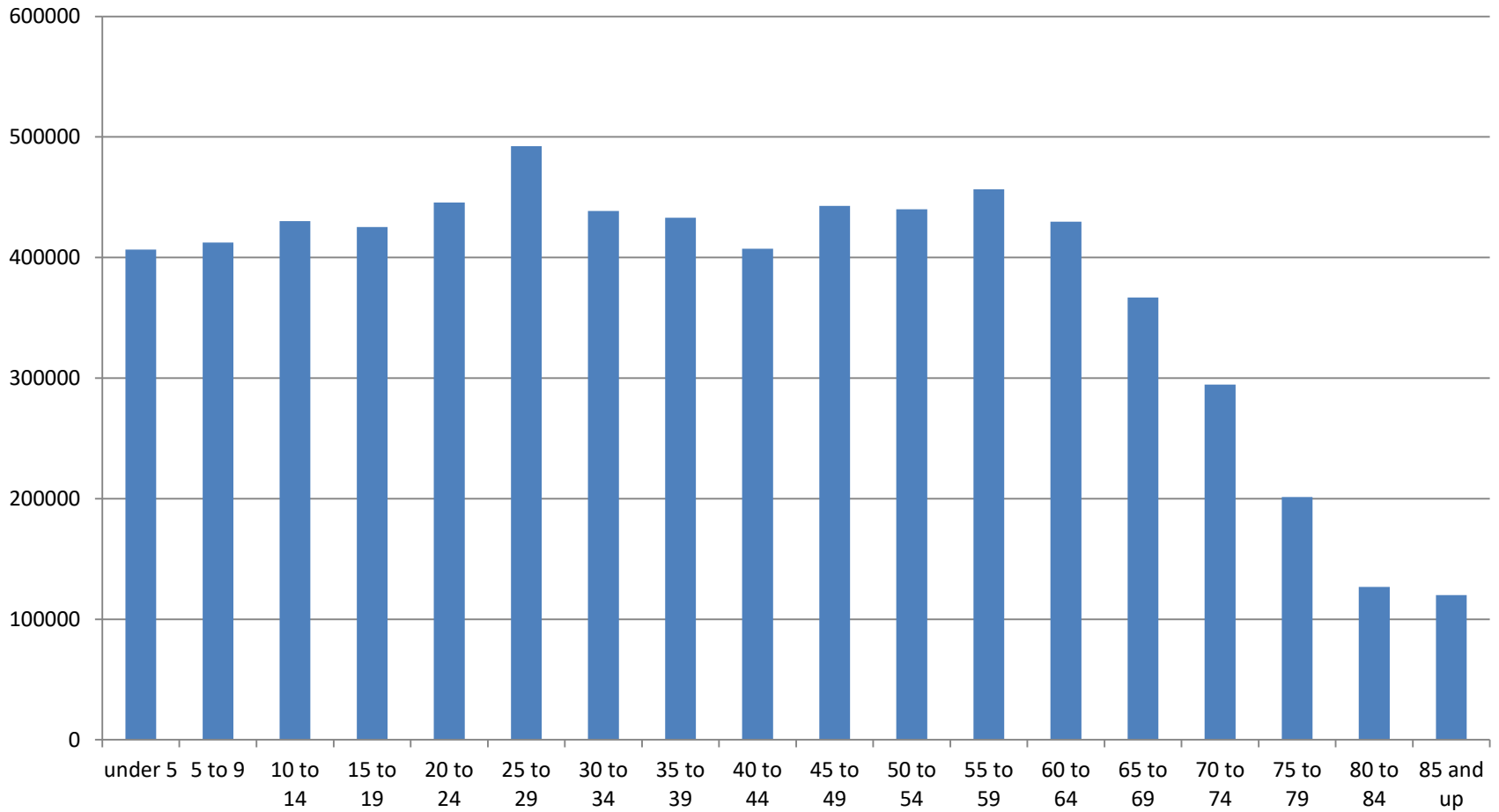
A few key numbers on race

- 2010:
 - 75.6% White Non-Hispanic
 - 16.5% Black Non-Hispanic
 - 4.6% Hispanic
 - 3.2% Non-Hispanic, NWoBA.
- 2050:
 - 62.7% White Non-Hispanic
 - 16.7% Black Non-Hispanic
 - 12.8% Hispanic
 - 6.3% Non-Hispanic, NWoBA

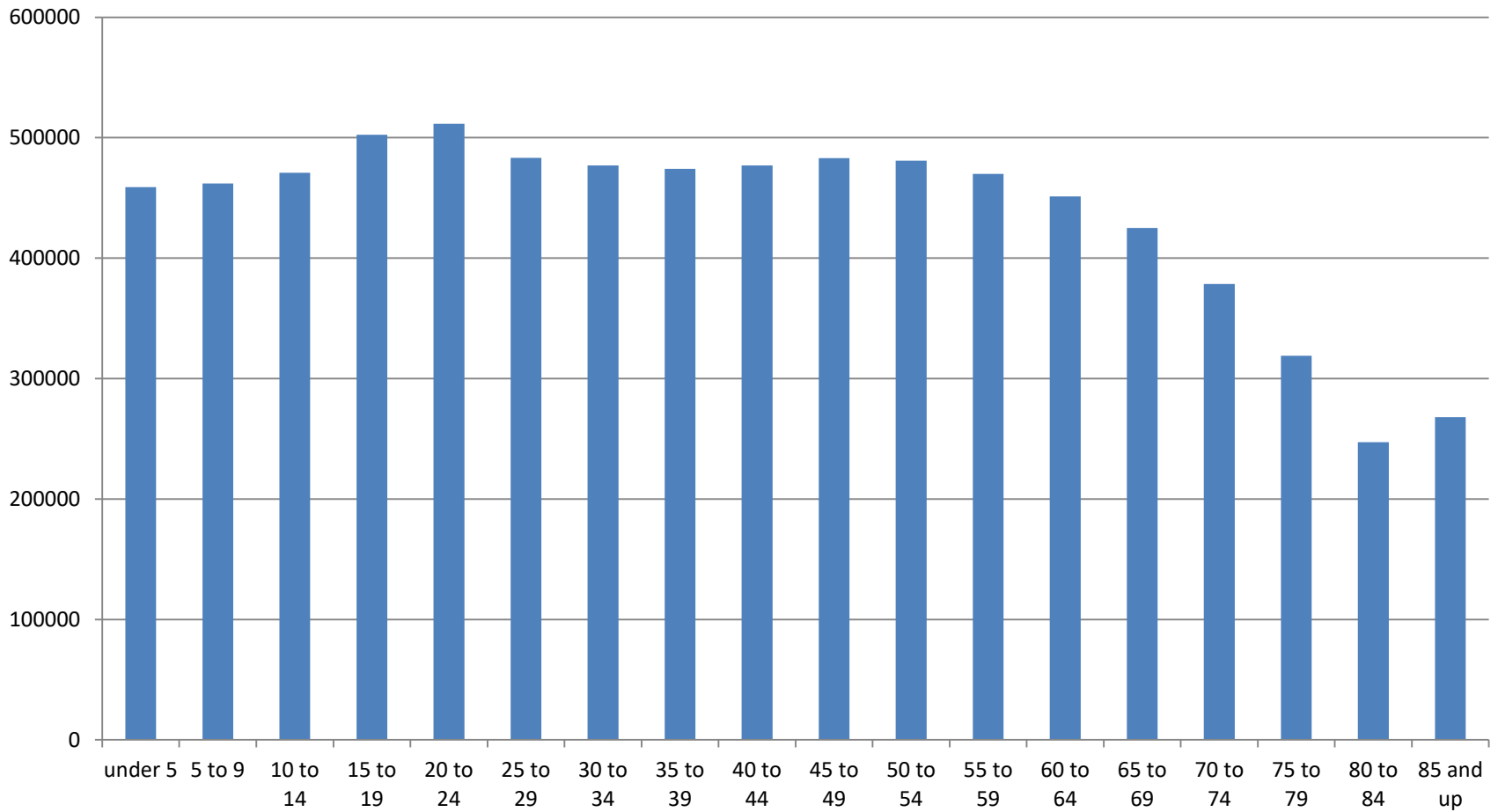
Hispanic Population Growth

- 1990: 32,741
- 2000: 123,838
 - 278% Growth
- 2010: 290,059
 - 234% growth
- 2020: 409,704 (projected)
 - 41.2%growth
- 2030: 583,221 (projected)
 - 42% growth
- 2040: 801,894 (projected)
 - 37.4% growth

Age Histogram, 2018



Age Histogram, 2040



A few key stats

- Right now, there are 2 persons aged 25-50 for each person aged 65+
- Five persons aged 25-50 for every person aged 75+
- By 2040, those ratios are expected to fall to 1.45:1 and 2.8:1 respectively.
 - In 33 counties, we predict the ratio of 25-50s to 65+ will be less than 1.
- Implications for labor force participation and provision of services.

Continued Urbanization: Counties with Projected Largest Change 2018-2040

County	Projected Population Change
Rutherford	180505.5
Williamson	129832.9
Davidson	111901.3
Montgomery	95835.2
Knox	84510.5
Wilson	64668.1
Sumner	63300.5
Hamilton	50701.3
Shelby	39656.1
Maury	29383.9

These 10 counties are projected to account for about 80% of the TN's population growth. They currently account for 60% (ish) of the current population.

29 counties are expected to contract over the next 30 years.

If I can be of assistance, please reach out
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