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Accuracy Analysis of Long-Term Planning Projections for Utah and its Counties

With over half a century of population projections in Utah, this analysis highlights the difficulty of accurately identifying the future population based on current trends.

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Analysis in Brief

Analyzing the accuracy of half a century of planning projections in Utah demonstrates the challenges of long-term modeling in a state where population growth and change have been constants. At the state level, series have both under and over projected the population. The 1980s were characterized by over projection, on average. From 1990 to 2010, series tended to under project the population. Series produced since 2000 tend to over project the population. While these trends hold true, individual projection series error differs widely and is more variable at the county level.

Key Findings:

- Since 1967, 19 official population projections influenced long-term planning in Utah – Production of these state and county-level series shifted between the state government and the University of Utah throughout the decades.
- The accuracy of projection series depends on multiple factors - Error arises when the reality of the future deviates from assumptions. Additional influence comes from population size, growth rates, and time.
- Series most accurately projected the population of Salt Lake, Davis, Box Elder, Garfield, and Cache counties – In general, population projections for these counties have been the closest to the actual population over time.

- Series least accurately projected the population of Washington, Summit, Kane, Carbon, and Emery counties – In general, population projections for these counties have had the most deviation from the actual population over time.
- Until recent decades, Washington, Wasatch, Summit, Iron, and Utah counties experienced under projection – Prior to the 2005 series, population projections for these counties fell below the actual population. The 2005 and 2008 series over-projected population in these counties. In Summit County, the switch from under projection began with the 2002 series.
- Projections of Kane, Carbon, Piute, Emery, and Grand counties typically over project the population – The majority of population projection series for these counties over project the population. Kane and Grand counties experienced under-projection in the 1980s and early 1990s.

Projecting the population is not an easy undertaking in Utah's dynamic environment but is necessary to help decision makers have a better understanding of the state's future. Maintaining investment in high-quality long-term projections ensures a solid foundation for forward-thinking in planning, policy, and business decision making.



Projected vs. Actual Population, State of Utah

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Introduction

For over fifty years, different government and universitybased entities produced a total of 19 official long-term planning projections for Utah. This report analyzes the accuracy of each baseline projection, intending to inform and improve future modeling. While many official projection series include additional detail, such as economic projections, components of change, and age categories, this analysis focuses exclusively on total population.

History

Early Models (1967-1972)

The Bureau of Economic and Business Research (BEBR) at the University of Utah prepared the first demographic projections of Utah and its counties in 1967 with funding from the Utah State Planning Coordinator (SPC).¹ The 1967 series laid the foundation for projections work in the state. BEBR also produced a short-term series (eight-year horizon) in 1972. Short-term series are not included in this analysis.

Utah Process Economic and Demographic Model (1975-2002)

In the early 1970s, the SPC convened all state agencies to collectively consider planning in what would become known as the Utah Process. The Utah Office of Planning and Budget implemented the Utah Process Economic and Demographic Model (UPED) in 1975. The UPED model produced 13 series and was Utah's longest-tenured demographic and economic projection model. Projection horizons ranged from 14 to 29 years for UPED series.

REMI Model (2005-2012)

In 2005 the Governor's Office of Planning and Budget (GOPB) produced demographic projections using software from Regional Economics Models, Inc. (REMI). GOPB produced a total of three baseline series using the REMI model. REMI produced projection series with horizons between 44 and 51 years.

Utah Demographic and Economic Model (2017-Present)

In 2015, the Utah Legislature tasked the Gardner Institute with producing the official demographic and economic projections for Utah and its counties.² The Gardner Institute created the Utah Demographic and Economic Model (UDEM) and has produced three baseline projections to date, with projection horizons ranging from 9 to 48 years. The 2019 short-term projection series is not included in this analysis. Due to a January 2022 release, the 2021 series is also not included.

What is a Baseline Series?

In Utah, long-term planning projections present one plausible scenario, sometimes referred to as the most-likely or baseline scenario. Projections can also produce high, low, or other custom scenarios. This analysis includes only baseline scenarios. In this document, the terms series and baseline are used interchangeably.



Figure 1: Projection Horizons in Years by Series

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

Methodology

This analysis incorporates every known demographic baseline projection produced for the state of Utah and its counties. The 1975 series only projected population at the state level. The 1980 series is based on the 1979 baseline but incorporated updated inputs to better reflect trends occurring in 1980. Additionally, series produced between 1967 and 1986 used five-year projection windows. Linear interpolation between timepoints converted these series to single-year detail.

Due to incomplete or missing documentation for each series, this analysis assumes that the first modeled year is one year after the series was published. For example, the first modeled year for the 1967 series is assumed to be 1968. The one exception was the 1979 series, in which the first modeled year was 1981.

Actual population values come from the Utah Population Committee (formerly Utah Population Estimates Committee) and reflect July 1 of the given year. These data are available from 1967 to 2021.

Accuracy Metrics

Multiple metrics exist to assess the accuracy of projections. Using several of these provides a holistic view of projection accuracy.

- Error (*E*) and Percent Error (*PE*) measure the directionality of errors (over or under projection).
- Absolute Percent Error (*APE*) assesses the accuracy of a series at a single time point.
- Mean Absolute Percent Error (*MAPE*) assesses the accuracy of a series over a given time period.

To avoid disadvantaging older series, this analysis uses timebound MAPEs. Rather than calculating MAPEs using all available APEs for a baseline, this analysis uses the first 5, 10, or 20 APEs in a series. Time-bound MAPEs allow the assessment of accuracy in the short term (5-year MAPE), medium term (10-year MAPE), and long term (20-year MAPE).³

Formulae:

$$E_{t} = PE_{t} - A_{t}$$

$$PE_{t} = \frac{E_{t}}{A_{t}}$$

$$APE_{t} = |PE_{t}|$$

$$MAPE = \frac{1}{n} \sum_{t=1}^{n} APE_{t}$$

$$E_{t} = \text{Error at time } t$$

$$PE_{t} = \text{Percent error at time } t$$

$$P_{t} = \text{Projected Population at time } t$$

$$A_{t} = \text{Actual Population at time } t$$

- n = Number of time points in the MAPE
 - (5, 10, or 20 years)

Limitations

This analysis focuses on the accuracy of total population projections, not components of change (births, deaths, and net-migration), age detail, or other important demographic characteristics. As a result, projections of total population may be right for the wrong reason. Additionally, accuracy is assessed both in the long and short term, but models are designed specifically for long-term projection, sometimes as long as 50 years.

Factors Influencing Accuracy

No projection will be 100% accurate. Long-term population projections combine known inputs from the recent past and assumptions about future trends. Analysts must make assumptions about future trends in fertility, life expectancy, and economic conditions, among others. When these assumptions do not align with the reality of how the future unfolds, error arises.

Population projections rely upon estimates as a foundation. These population estimates are also subject to error. The further removed estimates are from census enumerations, the more uncertain they become. Estimates are also subject to change when new census data are released.⁴ Furthermore, certain decades' population estimates were more accurate than others, potentially impacting the accuracy of projections produced in those decades. In summary, error in estimates leads to error in projections.

Additionally, all series in this analysis project long-term population trends and do not attempt to project short-term cycles. As a result, almost every series over and under projects the population at different time points. In addition to these reasons and random error, several additional factors contribute to projection error.

Projections become less accurate over time

Projection models tend to become less accurate the farther they get from the known data points. The closer a series is to its jump-off year, the more accurate it tends to be.

Smaller populations are more difficult to model

An inverse relationship exists between the size of a population and the percent error of its projections. Larger counties and the state typically have low percent errors, while smaller counties receive higher errors.

High and fluctuating growth is hard to predict

Geographies with high or fluctuating growth rates pose challenges to modelers. Alternatively, more accurate modeling can occur in counties with stable growth.

Historical Context

Understanding population growth trends and their context provides a more holistic understanding of projection accuracy. Utah's population has grown since population accounting by the Census Bureau began in the late 1800s.

For context in this analysis: The 1980s experienced lower growth, driven by economic factors. Beginning in the 1990s, a wave of migration led to intense growth.⁵ Although Utah was the fastest-growing state in the nation between 2010 and 2020, the growth rate was lower than in the previous two decades.⁶

Population change and the rates of growth at the county level have varied. Since the 1970s, only a handful of counties have experienced decadal population declines. Counties with larger populations tended to have stable growth, while areas such as southwest Utah and counties neighboring the Wasatch Front have experienced periods of rapid growth. Economic circumstances such as mine or plant closures, large employers joining the economy, and the recessions of the 1980s and the late 2000s have led to differential growth at the county level.



Source: U.S. Census Bureau, Decennial Census. Calculations by Kem C. Gardner Policy Institute.

Notes

1. Black, T., Rasmussen, J., & Hachman, F. (1967). Population Projections: Utah and Utah's Counties. Economic and Population Studies: Utah State planning Program.

2. Hollingshaus, M., Harris, E., Hogue, M., Perlich, P. (2018). The Utah Demographic and Economic Model: Version 2017. Kem C. Gardner Policy Institute.

3. Long-term projection horizons range from 30 to 50 years. However, assessing accuracy in this long of term excludes more recent series from the analysis. For example, 40-year MAPEs could only be calculated for the oldest five series produced.

4. Harris, E. (2021). Blog: A Demographer's Revisionist History: Intercensal Population Estimates for 2010-2019 Released. Kem C. Gardner Policy Institute.

5. Young, N., & Bateman, M. (2021). Utah's 2020 Census Apportionment, Resident, and Overseas Populations. Kem C. Gardner Policy Institute.

6 Perlich, P., & Downen, J.(2011). Census 2010 - A First Look at Utah Results. Utah Economic and Business Review, 71(2). (2011). Bateman, M., Harris, E., & Albers, E. (2021). First Insights – 2020 Census Utah Counties and Communities. Kem C. Gardner Policy Institute.

State and County Accuracy Profiles

This analysis assesses accuracy for the state and each of its counties. Profiles begin with a generalized performance assessment for different decades, including over and under projection and individual series performance for each geography.

Each profile then focuses on the accuracy of 2020 population projections using the 2020 APE for each available series, followed by a discussion of short, medium, and long-term performance using time-bound MAPEs.

Gardner Institute Model Results

The Gardner Institute is committed to the continued improvement of its long-term planning projections. Government agencies, businesses, researchers, and private individuals rely on these official projections to make informed decisions about the future. The recency of the Gardner Institute projections precludes assessment of accuracy in the short, medium, and long term described in the methodology section. However, a special MAPE was calculated for the 2017 series using all available time points (four years). APEs for 2018 – 2021 are also available for the 2017 series and are included in the state and county profiles.

Results

The 2017 baseline is a long-term series ranging from 2018 to 2065. The MAPE is 1.0% at the state level. The MAPEs vary by county and are influenced by the sources of error listed above (see Figure 4). While this performance in the shortterm is encouraging, the design of this model is for long-term projection.





State of Utah

Early series both over and under projected Utah's population. Between 1980 and 1990, all series over projected the population on average. Of the series that projected from 1990 to 2010, most under projected the population. Excluding the 2019 baseline, all series produced since 2000 over projected the population by 2021.

The 2012 baseline most accurately projected the 2020 population with an APE of 0.7%. The 2012, 1997, 2017, 2002,

and 2000 series also received APEs below 5%. The 1967 series least accurately projected the population with an APE of 18.6%.

The 2012 series most accurately projected the state's population in the short term with a 5-year MAPE of 0.2%. The 2002 series performed best in the medium term with a 10-year MAPE of 1.4%. In the long term, the 1997 was most accurate, with a 20-year MAPE of 2.2%. The 2008 series performed worst in the short term, 1992 in the medium term, and 1990 in the long term.





Figure 5: APE by Series, State of Utah

Table 1: MAPEs, State of Utah

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	4.9%	4.2%	3.2%	1986	5.8%	4.2%	4.5%	1997	2.7%	3.0%	2.2%
1972	5.5%	7.4%	7.4%	1987	1.6%	3.1%	7.2%	2000	5.2%	5.3%	3.9%
1975	2.3%	3.2%	2.8%	1988	1.6%	4.1%	8.1%	2002	1.6%	1.4%	2.3%
1979	3.3%	7.1%	6.6%	1990	4.4%	8.1%	11.9%	2005	0.9%	2.6%	NA
1980	2.8%	6.7%	6.3%	1992	5.9%	8.5%	10.9%	2008	6.4%	8.1%	NA
1984	5.2%	6.7%	4.3%	1994	3.3%	4.4%	5.3%	2012	0.2%	NA	NA

Beaver County

In Beaver County, all series tended to over project the population between 1970 and 1990, aside from the 1967 series which under projected during the 1980s. This trend shifted in the mid-1990s and all but two series under projected the population by 2000. From the year 2000 to the present, series produced before 1994 tended to under project, while newer series tended to over project. Between 1990 and 2010, many series had APEs below 10%.

The 2017 baseline most accurately projected the 2020

population with an APE of 0.1%. The 1992 and 2012 series also received APEs below 10%. The 2005 baseline least accurately projected the population, with an APE of 63.2%.

The 2002 series most accurately projected Beaver County's population in the short and medium term, with a 5-year MAPE of 1.4% and a 10-year MAPE of 3.1%. The 1979 series performed best in the long term with a 20-year MAPE of 5.0%. The 1994 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.





Figure 7: APE by Series, Beaver County

Table 2: MAPEs, Beaver County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE		Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	10.1%	10.4%	7.6%] [1988	5.6%	5.2%	7.2%	2002	1.4%	3.1%	6.3%
1979	2.0%	6.0%	5.0%		1990	2.3%	4.3%	5.7%	2005	6.6%	19.0%	NA
1980	2.5%	6.3%	5.1%	1 [1992	9.2%	9.6%	8.8%	2008	2.9%	9.7%	NA
1984	4.5%	4.2%	7.4%		1994	27.8%	32.5%	38.7%	2012	2.7%	NA	NA
1986	12.2%	7.0%	6.9%	1 [1997	14.7%	18.0%	24.9%				
1987	6.2%	5.4%	7.1%		2000	5.0%	8.6%	13.5%				

Box Elder County

Between 1970 and 1990, all series over projected the population of Box Elder County. Of all series that projected into the 1990s, half over projected by 2000 while the other half under projected, though positive errors were larger than negative ones. From the year 1995 to the present, all but three series resulted in APEs below 10% and many series had APEs below 5%.

The 2017 baseline most accurately projected the 2020 population with an APE of 0.7%. The 1994 and 2008 series also

received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 30.4%.

The 2008 series most accurately projected the population of Box Elder County in the short and medium term, with a 5-year MAPE of 0.4% and a 10-year MAPE of 0.9%. In the long term, the 1994 series performed the best with a 20-year MAPE of 1.0%. In 1986 series performed worst in the short term, while the 1967 series performed worst in the medium and long term.







Table 3: MAPEs, Box Elder County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	12.0%	16.3%	19.0%	1988	5.3%	3.6%	2.6%	2002	2.9%	4.5%	7.1%
1979	9.1%	13.0%	13.9%	1990	3.8%	3.4%	5.1%	2005	2.5%	2.1%	NA
1980	10.3%	13.6%	14.2%	1992	3.1%	5.4%	6.9%	2008	0.4%	0.9%	NA
1984	7.8%	12.1%	15.0%	1994	1.5%	1.4%	1.0%	2012	2.7%	NA	NA
1986	12.3%	11.8%	9.6%	1997	0.8%	2.5%	4.4%				
1987	5.5%	4.4%	2.8%	2000	3.6%	4.9%	7.3%				

Cache County

Until the year 1992, all series aside from the 1967 baseline over projected the population of Cache County. By the year 1996, all but two series under projected. Series produced from 1997 to the present tended to over project the population, while all series produced before then under projected from the year 2000 to the present.

The 2017 baseline most accurately projected the 2020 population with an APE of 0.1%. The 1997, 2002, 2012, and 2000 series also received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 43.2%.

The 2002 series most accurately projected the population of Cache County in the short term, with a 5-year MAPE of 0.4%. The best medium and long-term series was the 1997 baseline, with a 10-year MAPE of 1.0% and a 20-year MAPE of 1.0%. The 1992 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.





Figure 11: APE by Series, Cache County

Table 4: MAPEs, Cache County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	6.8%	5.1%	6.8%	1988	1.9%	5.2%	9.1%
1979	6.1%	9.8%	8.6%	1990	4.2%	8.6%	13.2%
1980	6.5%	10.1%	8.7%	1992	9.9%	13.5%	17.4%
1984	5.5%	5.1%	4.6%	1994	6.3%	8.0%	9.4%
1986	7.4%	3.9%	3.9%	1997	1.5%	1.0%	1.0%
1987	1.5%	3.8%	8.0%	2000	4.3%	4.5%	3.7%

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	0.4%	1.4%	3.2%
2005	0.6%	2.7%	NA
2008	5.4%	7.8%	NA
2012	1.9%	NA	NA

Carbon County

Over projection characterized most of Carbon County's baseline series. While a few series under projected for some time, all over projected by the end of their time horizon. The size of Carbon County's population has been relatively constant since 1990, but all projection series have predicted growth for the county.

The 2005 baseline most accurately projected the 2020 population with an APE of 2.6%. The 2012 baseline was the only other series with an APE below 10%. The 1967 baseline least accurately projected the population, with an APE of 46.7%.

The 2002 series most accurately projected Carbon County's population in the short and medium term, with a 5-year MAPE of 1.2% and a 10-year MAPE of 2.0%. In the long term, the 1967 series performed the best with a 20-year MAPE of 7.4%. The 1986 series performed worst in the short and medium term. The 1980 series performed worst in the long term, with a 20-year MAPE of 44.0%.





Figure 13: APE by Series, Carbon County

Table 5: MAPEs, Carbon County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE
1967	10.2%	6.0%	7.4%	1988	15.7%	14.7%	16.9%	2002	1.2%	2.0%
1979	12.6%	28.5%	43.4%	1990	10.9%	9.4%	11.9%	2005	10.8%	9.0%
1980	14.6%	29.6%	44.0%	1992	5.6%	7.0%	12.7%	2008	3.7%	8.3%
1984	21.2%	31.4%	42.8%	1994	4.1%	5.1%	9.3%	2012	3.8%	NA
1986	31.2%	35.7%	43.3%	1997	13.6%	15.8%	22.5%			
1987	14.1%	15.0%	16.6%	2000	10.0%	10.7%	16.1%			

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

20-Year MAPE 9.8% NA NA NA

Daggett County

As Utah's smallest population county, projecting the future of Daggett County is a long-standing challenge. Between 1970 and 1990, all series tended to over project the population. Of the series that projected into the 1990s, all over projected in 1990. However, by 2000, all under projected the population, aside from the 1967 series. Series that projected from 2000 to 2015 tend to under project. However, by 2020, all but two series over projected the population.*

tion with an APE of 4.7%. The only other series under an APE of 10% was the 1994 baseline, with an APE of 4.8%. The 1967 baseline least accurately projected the population, with an APE of 112.0%.

The 2005 series most accurately projected the population of Daggett County in the short term, with a 5-year MAPE of 2.0%. The best medium-term series was the 2002 baseline, with a 10year MAPE of 2.7%. In the long term, the 1997 series performed the best with a 20-year MAPE of 5.7%. The 1967 series performed worst in the short, medium, and long term.

The 2000 baseline most accurately projected the 2020 popula-

* The Daggett County Jail closed in 2017, which contributes to over-projection in subsequent years.





Figure 15: APE by Series, Daggett County

Table 6: MAPEs, Daggett County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	29.7%	28.5%	35.9%	1988	3.8%	7.6%	13.9%
1979	13.9%	19.9%	15.2%	1990	13.6%	17.7%	21.2%
1980	9.6%	14.2%	11.6%	1992	9.4%	16.0%	21.3%
1984	23.3%	20.1%	13.0%	1994	10.3%	14.2%	15.4%
1986	11.3%	6.7%	9.1%	1997	6.1%	4.4%	5.7%
1987	3.6%	6.5%	12.7%	2000	18.6%	20.0%	17.2%

0-Year 20-Year ЛАРЕ MAPE 8.8% 2.7% 2.8% NA 7.6% NA NA NA

Davis County

Projections of Davis County's population are characterized by under projection. Only five series consistently over project the population. Even though series tend to under project, most APEs for Davis County are below 10%.

The 2017 baseline most accurately projected the 2020 population with an APE of 0.4%. Eight other series also received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 14.2%.

The 1994 series most accurately projected the population of Davis County in the short term, with a 5-year MAPE of 0.6%. The best medium-term series was the 1988 baseline, with a 10-year MAPE of 1.0%. In the long term, the 1987 series performed the best with a 20-year MAPE of 1.5%. The 1979 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.







Table 7: MAPEs, Davis County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE
1967	1.9%	1.0%	2.4%	1988	1.7%	1.0%	1.6%	2002	4.2%	4.6%
1979	12.4%	18.9%	22.4%	1990	1.1%	2.5%	4.6%	2005	1.2%	1.4%
1980	11.4%	18.4%	22.1%	1992	3.7%	5.3%	7.8%	2008	4.8%	4.0%
1984	6.3%	10.7%	14.3%	1994	0.6%	1.8%	4.2%	2012	1.4%	NA
1986	9.5%	11.7%	13.1%	1997	1.9%	3.4%	3.6%			
1987	2.0%	1.7%	1.5%	2000	2.6%	4.3%	4.6%]		

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

20-Year MAPE 4.4%

NA

NA

NA

Duchesne County

The 1967 series under projected the population of Duchesne County, with APEs reaching 65.0%. During the 1980s, all series over projected the population on average. Series produced between 1992 and 2008 all under projected the population. Series produced since 2010 all over projected the population.

The 2008 baseline most accurately projected the 2020 population with an APE of 2.7%. The 2005, 1997, and 2002 series also received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 63.8%.

The 1997 series most accurately projected the population of Duchesne County in the short and medium term, with a 5-year MAPE of 1.1% and a 10-year MAPE of 3.5%. In the long term, the 1990 series performed the best with a 20-year MAPE of 4.1%. The 1986 series received the highest MAPE in the short term, while the 1967 series performed worst in the medium and long term.





Figure 19: APE by Series, Duchesne County

Table 8: MAPEs, Duchesne County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series
1967	23.1%	34.7%	43.1%	1988	16.0%	13.0%	12.4%	2002
1979	1.7%	8.8%	11.1%	1990	6.8%	5.4%	4.1%	2005
1980	3.8%	6.0%	6.3%	1992	3.7%	5.9%	9.4%	2008
1984	14.3%	23.6%	26.3%	1994	4.1%	5.1%	9.1%	2012
1986	27.0%	23.9%	18.9%	1997	1.1%	3.5%	8.0%	
1987	14.9%	13.2%	12.6%	2000	1.1%	5.8%	8.5%	

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	3.8%	8.3%	8.5%
2005	12.5%	13.5%	NA
2008	7.2%	5.5%	NA
2012	5.1%	NA	NA

Emery County

Most series over projected the population of Emery County. One exception is the 1967 series, which under projected the population. All other series over projected the population, with APEs reaching 93.8%. Several series projected the population from 2000 to 2010 with APEs below 10%.

The 2017 baseline most accurately projected the 2020 population with an APE of 12.9%. The 2012 baseline was the only other series with an APE below 15%. The 1997 baseline least accurately projected the population, with an APE of 35.8%.

The 2000 series most accurately projected the population of Emery County in the short term, with a 5-year MAPE of 1.3%. The best medium-term series was the 2002 baseline, with a 10-year MAPE of 2.0%. In the long term, the 1994 series performed the best with a 20-year MAPE of 4.1%. The 1986 series received the highest MAPE in the short term, while the 1979 series performed worst in the medium and long term.





Figure 21: APE by Series, Emery County

Table 9: MAPEs, Emery County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE
1967	7.4%	15.5%	30.6%	1988	14.3%	11.0%	14.7%	2002	1.7%	2.0%
1979	17.2%	40.2%	63.0%	1990	8.6%	5.4%	9.7%	2005	2.9%	3.1%
1980	16.6%	39.9%	62.9%	1992	3.3%	3.0%	5.4%	2008	3.8%	11.0%
1984	25.3%	29.1%	31.9%	1994	4.8%	3.0%	4.1%	2012	6.7%	NA
1986	29.7%	28.8%	33.4%	1997	7.4%	12.2%	18.1%			
1987	15.4%	12.7%	14.6%	2000	1.3%	2.4%	8.8%			

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

20-Year MAPE 10.5% NA NA

Garfield County

Series that projected population between 1980 and 1992 over projected Garfield County. Of all series that projected into the 1990s and 2000s, most series under projected the population, though most APEs were under 10%. Projection series produced from 1994 on tended to over project population, with every series over projecting by 2021.

The 1992 baseline most accurately projected the 2020 population with an APE of 0.4%. The 2017 baseline was the only other series with an APE below 10%. The 2000 baseline least accurately projected the population, with an APE of 29.1%.

The 1967 series most accurately projected the population of Garfield County in the short and medium term, with a 5-year MAPE of 1.2% and a 10-year MAPE of 1.7%. In the long term, the 1990 series performed the best with a 20-year MAPE of 2.9%. The 1980 series consistently received the highest MAPE, making it the least accurate in the short, medium, and long term.





Figure 23: APE by Series, Garfield County

Table 10: MAPEs, Garfield County

eries	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
967	1.2%	1.7%	7.1%	1988	4.0%	3.7%	4.3%
979	10.0%	15.8%	19.2%	1990	1.6%	2.7%	2.9%
980	12.7%	17.1%	19.8%	1992	5.5%	5.7%	4.5%
984	2.0%	1.8%	4.3%	1994	2.4%	3.7%	5.8%
986	5.6%	3.1%	3.7%	1997	4.0%	8.4%	12.6%
1987	4.7%	3.7%	4.2%	2000	5.1%	6.3%	13.2%

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	3.7%	3.7%	9.9%
2005	4.1%	3.7%	NA
2008	1.2%	4.3%	NA
2012	7.2%	NA	NA

Grand County

Most series over projected the population of Grand County, though four series (1987, 1988, 1990, and 1992) consistently under projected the population. Series produced after 2000 over projected the population on average, though APEs during this period did not typically exceed 10%.

The 2005 baseline most accurately projected the 2020 population with an APE of 0.9%. The 1992, 2000, and 2002 series also received APEs below 5%. The 1997 baseline least accurately projected the population, with an APE of 132.0%.

The 2002 series most accurately projected the population of Grand County in the short and long term, with a 5-year MAPE of 1.8% and a 20-year MAPE of 2.2%. The best medium-term series was the 2005 baseline, with a 10-year MAPE of 1.8%. The 1997 series consistently received the highest MAPE, making it the least accurate in the short, medium, and long term.





Figure 25: APE by Series, Grand County

Table 11: MAPEs, Grand County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	18.2%	15.5%	12.0%	1988	4.9%	9.6%	11.2%
1979	15.9%	31.1%	29.7%	1990	9.7%	14.3%	15.3%
1980	15.4%	30.9%	29.6%	1992	12.4%	13.4%	11.8%
1984	14.3%	14.4%	10.3%	1994	6.0%	10.4%	21.3%
1986	15.0%	10.2%	9.3%	1997	36.8%	50.8%	74.9%
1987	3.6%	7.4%	10.2%	2000	9.1%	7.2%	5.2%

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	1.8%	2.5%	2.2%
2005	1.9%	1.8%	NA
2008	5.7%	7.6%	NA
2012	2.0%	NA	NA

Iron County

Most series under projected the population of Iron County. Until the year 2000, all series under projected the population with APEs up to 56.9%. The 2005 and 2008 series are the only baselines that over projected the population on average.

The 2012 baseline most accurately projected the 2020 population with an APE of 1.0%. The 2017 baseline was the only other series with an APE below 5%. The 1967 baseline least accurately projected the population, with an APE of 68.8%.

The 1997 series most accurately projected the population of Iron County in the short, medium, and long term, with MAPEs under 2.5%. The 1967 series performed worst in the short term, while the 1990 series performed worst in the medium and long term.





Figure 27: APE by Series, Iron County

Table 12: MAPEs, Iron County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Ye MA
1967	14.9%	19.4%	26.8%	1988	4.9%	15.4%	27.4%	2002	9
1979	1.6%	5.7%	7.9%	1990	11.7%	20.3%	29.7%	2005	
1980	1.7%	5.7%	7.9%	1992	14.4%	19.1%	24.7%	2008	1
1984	2.5%	3.0%	12.7%	1994	14.3%	15.8%	18.2%	2012	(
1986	1.3%	7.7%	19.3%	1997	0.8%	2.4%	2.5%		
1987	1.8%	10.7%	23.7%	2000	5.7%	8.5%	9.0%		

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	9.5%	10.9%	11.5%
2005	2.6%	7.9%	NA
2008	11.5%	15.0%	NA
2012	0.9%	NA	NA

Juab County

Series produced before 2000 tended to under project the population of Juab County, though the 1979 and 1980 series over projected the population with APEs up to 48.4%. Series produced after 2000 tended to over project the population.

The 1997 baseline most accurately projected the 2020 population with an APE of 0.1%. The 2000 and 2005 series also received APEs below 10%. The 1967 baseline least accurately projected the population, with an APE of 44.2%.

The 1987 series most accurately projected the population of Juab County in the short term, with a 5-year MAPE of 1.5%. The best medium-term series was the 1967 baseline, with a 10-year MAPE of 1.6%. In the long term, the 1997 series performed the best with a 20-year MAPE of 2.5%. The 1980 series consistently received the highest MAPE, making it the least accurate in the short, medium, and long term.





Figure 29: APE by Series, Juab County

Table 13: MAPEs, Juab County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Ye MAF
1967	2.7%	1.6%	4.3%	1988	2.1%	10.6%	19.4%	2002	5
1979	15.7%	28.9%	29.7%	1990	9.1%	16.8%	24.8%	2005	3
1980	19.9%	31.0%	30.7%	1992	15.9%	21.6%	26.3%	2008	6
1984	16.3%	15.1%	9.7%	1994	14.8%	18.1%	21.3%	2012	8
1986	4.7%	11.8%	21.3%	1997	2.2%	2.2%	2.5%		
1987	1.5%	7.7%	16.8%	2000	3.0%	2.4%	5.1%		

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	5.0%	6.0%	11.2%
2005	3.9%	4.8%	NA
2008	6.1%	10.9%	NA
2012	8.1%	NA	NA

Kane County

Most series over projected the population of Kane County. However, between 1990 and 2010, around half of all series under projected the population. By 2020, all series over projected the population.

The 2017 baseline most accurately projected the 2020 population with an APE of 6.1%. The 2012 and 2005 series also received APEs below 10%. The 1997 baseline least accurately projected the population, with an APE of 71.5%.

The 1988 series most accurately projected the population of Kane County in the short term, with a 5-year MAPE of 0.9%. The best medium-term series was the 1986 baseline, with a 10-year MAPE of 3.0%. In the long term, the 1990 series performed the best with a 20-year MAPE of 2.7%. The 1997 series received the highest MAPEs in the short and medium term, while the 1967 series performed worst in the long term.





Figure 31: APE by Series, Kane County

Table 14: MAPEs, Kane County

eries	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Ye MAP
967	5.3%	17.7%	86.4%	1988	0.9%	3.5%	4.0
979	14.9%	20.5%	29.6%	1990	2.2%	3.2%	2.7
1980	20.1%	23.1%	30.9%	1992	3.4%	8.3%	15.5
1984	12.1%	10.7%	10.0%	1994	4.0%	11.9%	23.5
1986	1.3%	3.0%	3.2%	1997	26.8%	31.8%	43.49
1987	2.3%	3.4%	3.9%	2000	3.2%	6.2%	19.8

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	5.7%	10.8%	23.2%
2005	9.1%	6.3%	NA
2008	2.5%	5.4%	NA
2012	4.0%	NA	NA

Millard County

Series tended to over project Millard County's population, with some exceptions. The 1967 series consistently under projected. The 1987 and 1992 series also under projected from 1990 until the mid-2000s. By 2020, all but two series over projected.

The 2012 baseline most accurately projected the 2020 population with an APE of 1.7%. The 1992 series was close with an APE of 4.0%. The 2005 baseline least accurately projected the population, with an APE of 41.3%.

The 2012 series most accurately projected the population of Millard County in the short term, with a 5-year MAPE of 0.7%. The best medium-term series was the 1994 baseline, with a 10-year MAPE of 2.1%. In the long term, the 2000 series performed the best with a 20-year MAPE of 4.4%. The 1984 series consistently received the highest MAPE, making it the least accurate in the short, medium, and long term.





Figure 33: APE by Series, Millard County

Table 15: MAPEs, Millard County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	6.9%	4.4%	12.7%	1988	5.6%	6.1%	4.7%	2002	6.2%	7.2%	9.6%
1979	5.0%	6.7%	8.3%	1990	10.6%	10.1%	12.4%	2005	10.9%	15.7%	NA
1980	5.1%	6.7%	8.4%	1992	5.8%	5.9%	5.0%	2008	12.7%	17.9%	NA
1984	42.1%	36.7%	35.2%	1994	2.2%	2.1%	5.2%	2012	0.7%	NA	N/
1986	3.2%	2.6%	9.1%	1997	5.1%	8.8%	15.7%				
1987	6.4%	6.7%	5.1%	2000	1.6%	2.6%	4.4%				

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

NA NA NA

Morgan County

On average, series under projected Morgan County's population, though several series made large over projections of the population, including the 1979, 1980, and 1984 series. Of series that projected from 1995 to 2005, several consistently had APEs below 5%.

The 2012 baseline most accurately projected the 2020 population with an APE of 3.3%. The 2017 baseline was the only other series with an APE below 10%. The 1967 baseline least accurately projected the population, with an APE of 51.4%.

The 1994 series most accurately projected the population of Morgan County in the short term, with a 5-year MAPE of 2.8%. The best medium-term series was the 1988 baseline, with a 10-year MAPE of 3.3%. In the long term, the 1986 series performed the best with a 20-year MAPE of 2.9%. The 1984 series consistently received the highest MAPE, making it the least accurate in the short, medium, and long term.

Figure 35: APE by Series, Morgan County

Table 16: MAPEs, Morgan County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	9.6%	5.6%	5.2%	1988	6.0%	3.3%	3.3%
1979	22.9%	35.4%	45.2%	1990	3.3%	5.5%	7.9%
1980	28.8%	38.4%	46.7%	1992	9.1%	12.6%	18.4%
1984	36.4%	56.2%	88.1%	1994	2.8%	5.3%	9.8%
1986	8.3%	5.2%	2.9%	1997	3.9%	6.3%	9.6%
1987	7.2%	4.4%	3.4%	2000	3.2%	5.6%	8.4%

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	9.5%	11.2%	14.2%
2005	3.1%	7.6%	NA
2008	12.9%	18.2%	NA
2012	4.6%	NA	NA

Piute County

Series tended to over project Piute County's population. Several series had short periods of under-projection, but all series over projected by 2020, with only two series under an APE of 10%.

The 2008 baseline most accurately projected the 2020 population with an APE of 5.9%. The 1992 baseline was the only other series with an APE below 10%. The 1997 baseline least accurately projected the population, with an APE of 50.1%.

The 2002 series most accurately projected the population of Piute County in the short and medium term, with a 5-year MAPE of 2.5%, and a 10-year MAPE of 2.3%. In the long term, the 1992 series performed the best with a 20-year MAPE of 4.1%. The 1980 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.

Table 17: MAPEs, Piute County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE
1967	21.7%	18.0%	13.1%	1988	19.1%	18.6%	16.5%	2002	2.5%	2.3%
1979	31.7%	45.9%	58.8%	1990	19.8%	19.0%	18.4%	2005	5.2%	6.5%
1980	37.8%	49.0%	60.4%	1992	5.3%	6.1%	4.1%	2008	8.6%	6.1%
1984	31.5%	34.6%	35.5%	1994	11.9%	10.8%	10.3%	2012	6.0%	NA
1986	33.1%	30.1%	32.9%	1997	18.7%	23.8%	29.5%			
1987	20.2%	18.9%	17.3%	2000	24.3%	23.9%	29.2%			

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

20-Year MAPE 5.4%

NA

NA

NA

Rich County

Influenced by high population growth in the late 70s and early 80s, series produced between 1979 and 1990 over projected the population of Rich County. Conversely, series produced after 1990 were influenced by low growth in the 80s and under projected. By 2021 all baselines aside from the 2008 series continued to under project the population.

The 2012 baseline most accurately projected the 2020 population with an APE of 0.6%. The 2017, 2005, and 2008 series also received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 32.4%.

The 2008 series most accurately projected the population of Rich County in the short and medium term, with a 5-year MAPE of 1.1% and a 10-year MAPE of 1.0%. In the long term, the 1997 series performed the best with a 20-year MAPE of 6.2%. The 1986 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.

Figure 39: APE by Series, Rich County

Table 18: MAPEs, Rich County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Ye MAI
1967	2.9%	4.5%	12.1%	1988	20.4%	19.8%	22.2%	2002	1
1979	4.6%	14.5%	23.1%	1990	16.1%	15.9%	16.6%	2005	3
1980	9.7%	17.1%	24.4%	1992	4.7%	5.5%	7.4%	2008	1
1984	26.2%	32.5%	34.2%	1994	5.4%	6.6%	8.2%	2012	1
1986	42.7%	38.3%	36.5%	1997	4.5%	4.3%	6.2%		
1987	20.6%	19.2%	21.8%	2000	7.5%	9.2%	12.0%		

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	1.2%	2.5%	3.7%
2005	3.4%	4.1%	NA
2008	1.1%	1.0%	NA
2012	1.3%	NA	NA

Salt Lake County

In Salt Lake County, all projection series over projected the population from 1970 to 1990 and on average under projected the population from 1990 through 2010. Every series tended to over project the population during 2010 to 2020. As a reflection of being Utah's largest population center, most APEs for Salt Lake County were under 5% and none exceeded 12%.

The 1992 baseline most accurately projected the 2020 population with an APE of 0.4%. The 2012, 2017, 2000, and 2005 series also received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 10.2%.

The 1979 series most accurately projected the population of Salt Lake County in the short term, with a 5-year MAPE of 0.4%. In the medium and long term, the 1987 series performed the best with a 10-year and 20-year MAPE of 1.3%. The 1967 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.

Figure 41: APE by Series, Salt Lake County

Table 19: MAPEs, Salt Lake County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE
1967	12.0%	11.3%	8.7%	1988	1.2%	1.7%	1.7%	2002	0.7%	2.6%
1979	0.4%	2.1%	1.7%	1990	5.8%	8.1%	8.4%	2005	1.1%	1.9%
1980	2.9%	3.3%	2.3%	1992	4.0%	5.0%	3.9%	2008	4.8%	5.6%
1984	3.2%	4.2%	3.4%	1994	2.4%	2.1%	2.3%	2012	0.5%	NA
1986	6.7%	4.2%	2.6%	1997	2.5%	1.3%	4.0%			
1987	1.6%	1.3%	1.3%	2000	5.5%	4.1%	3.1%			

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

rear PE 5.2% NA NA NA

San Juan County

Early series inaccurately projected the population of San Juan County, both over and under projecting the population. Of series that projected from the 1990s until 2010, most accurately projected the population, with APEs under 10%. Between 2010 and 2021, all but one series over projected the population, though several series had APEs under 10%.

The 2008 baseline most accurately projected the 2020 population with an APE of 5.4%. The 2005, 2012, and 1992 series also received APEs below 10%. The 2002 baseline least accurately projected the population, with an APE of 28.6%.

The 2008 series most accurately projected the population of San Juan County in the short term, with a 5-year MAPE of 1.6%. The best medium-term series was the 2005 baseline, with a 10-year MAPE of 1.5%. In the long term, the 1994 series performed the best with a 20-year MAPE of 3.3%. The 1980 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.

Figure 43: APE by Series, San Juan County

Table 20: MAPEs, San Juan County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	15.4%	17.2%	21.7%	1988	1.8%	6.0%	5.4%
1979	29.7%	44.3%	49.0%	1990	2.7%	6.3%	4.5%
980	38.6%	48.9%	51.2%	1992	7.3%	8.7%	5.7%
984	11.2%	13.0%	12.3%	1994	6.4%	4.6%	3.3%
1986	7.0%	3.5%	4.3%	1997	2.8%	2.6%	5.8%
1987	1.8%	4.1%	4.9%	2000	1.8%	3.3%	7.0%

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

10-Year

MAPE

6.1%

1.5%

1.8%

NA

20-Year

MAPE

13.5%

NA

NA

NA

Sanpete County

Aside from the 1967 baseline, early projection series over projected the population of Sanpete County until the year 1990. Series that projected from 1990 to 2010 under projected on average. Between 2010 to 2021, most series produced since 2000 over projected, while series produced before then tended to under project.

The 2000 baseline most accurately projected the 2020 population with an APE of 1.3%. The 2002, 1994, 2012, and 2017 series also received APEs below 10%. The 1967 baseline least

accurately projected the population, with an APE of 61.5%.

The 2005 series most accurately projected the population of Sanpete County in the short term, with a 5-year MAPE of 0.6%. The best medium-term series was the 1997 baseline, with a 10-year MAPE of 3.5%. In the long term, the 2000 series performed the best with a 20-year MAPE of 4.4%. The 1984 series performed worst in the short term, while the 1992 series performed worst in the medium and long term.

Table 21: MAPEs, Sanpete County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	2
1967	2.6%	7.5%	19.1%	1988	3.9%	11.2%	18.6%	2002	3.9%	4.2%	
1979	7.8%	16.9%	14.2%	1990	7.3%	14.1%	21.5%	2005	0.6%	3.8%	
1980	8.1%	17.0%	14.2%	1992	15.1%	19.7%	22.4%	2008	1.3%	4.2%	
1984	19.3%	18.5%	12.3%	1994	11.4%	13.9%	14.2%	2012	6.5%	NA	
1986	17.5%	8.8%	8.1%	1997	3.6%	3.5%	5.2%				
1987	2.8%	8.7%	16.7%	2000	5.3%	6.4%	4.4%				

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

9-Year 1APE 4.6% NA NA NA

Sevier County

Aside from the 1967 baseline, early projection series over projected the population of Sanpete County until the year 1990. Series that projected from 1990 to 2010 under projected on average. Between 2010 to 2021, most series produced since 2000 over projected, while series produced before then tended to under project.

The 1992 baseline most accurately projected the 2020 population with an APE of 3.1%. The 2012 baseline was the only other series with an APE below 5%. The 1967 baseline least accurately projected the population, with an APE of 38.8%.

The 2005 series most accurately projected the population of Sevier County in the short term, with a 5-year MAPE of 1.7%. In the medium and long term, the 1994 series performed the best with a 10-year MAPE of 2.4% and a 20-year MAPE of 3.7%. The 1986 series performed worst in the short term, while the 1980 series performed worst in the medium and long term.

Figure 47: APE by Series, Sevier County

Table 22: MAPEs, Sevier County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	8.6%	15.7%	24.0%	1988	2.5%	3.2%	5.9%
1979	18.5%	32.8%	43.0%	1990	2.3%	5.4%	9.0%
1980	20.9%	34.0%	43.4%	1992	5.2%	8.6%	7.8%
1984	18.6%	23.8%	21.4%	1994	1.9%	2.4%	3.7%
1986	28.6%	28.3%	29.0%	1997	4.4%	6.8%	14.2%
1987	3.1%	2.8%	5.4%	2000	3.9%	4.5%	8.6%

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	1.8%	3.1%	8.4%
2005	1.7%	4.6%	NA
2008	3.4%	5.7%	NA
2012	2.7%	NA	NA

Summit County

Until the year 2000, all series under projected the population of Summit County. Series produced after 1994 started to over project the population, with all series over projecting by 2020.

The 2017 baseline most accurately projected the 2020 population with an APE of 1.0%. The 2012 baseline was the only other series with an APE below 10%. The 1967 baseline least accurately projected the population, with an APE of 71.7%.

The 2012 series most accurately projected the population of Summit County in the short term, with a 5-year MAPE of 1.7%. The best medium-term series was the 1967 baseline,

with a 10-year MAPE of 2.7%. In the long term, the 1997 series performed the best with a 20-year MAPE of 6.9%. The 1988 series consistently received the highest MAPE, making it the least accurate in the short, medium, and long term.

Figure 49: APE by Series, Summit County

Table 23: MAPEs, Summit County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	4.3%	2.7%	14.8%	1988	22.6%	34.0%	43.9%
979	16.0%	21.2%	34.1%	1990	15.6%	21.8%	24.9%
980	19.7%	23.1%	35.1%	1992	19.5%	23.8%	24.7%
984	3.1%	8.3%	20.0%	1994	11.4%	11.5%	7.9%
1986	12.5%	25.6%	38.4%	1997	7.3%	5.9%	6.9%
1987	16.3%	27.9%	40.3%	2000	10.4%	9.1%	7.9%

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

20-Year MAPE 18.5% NA NA NA

Tooele County

All series over projected the population of Tooele County until the year 1992. Series that projected between 1990 and 2000 both over and under projected. By the year 2001, all series aside from the 1984 baseline under projected the population. Since 2000, most series under project, though the 2002, 2005, and 2008 series over project.

The 2012 baseline most accurately projected the 2020 population with an APE of 0.2%. The 2017 and 2002 series also received APEs below 10%. The 1992 baseline least accurately projected the population, with an APE of 49.6%.

The 2012 series most accurately projected the population of Tooele County in the short term, with a 5-year MAPE of 0.4%. The best medium and long-term series was the 2002 baseline, with a 10-year MAPE of 2.3% and a 20-year MAPE of 5.7%. The 1984 series consistently received the highest MAPE, making it the least accurate in the short, medium, and long term.

Figure 51: APE by Series, Tooele County

Table 24: MAPEs, Tooele County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE		Series	5-Year Series MAPE	5-Year 10-Yea Series MAPE MAPE
1967	12.8%	17.4%	17.9%	1988	11.3%	7.7%	15.3%		2002	2002 1.4%	2002 1.4% 2.3
979	14.6%	25.0%	25.7%	1990	3.6%	8.2%	19.6%	1	2005	2005 6.9%	2005 6.9% 16.4
980	15.3%	24.6%	25.9%	1992	8.6%	19.0%	30.4%		2008	2008 12.0%	2008 12.0% 17.4
984	25.1%	37.2%	35.5%	1994	20.6%	29.0%	33.2%	1	2012	2012 0.4%	2012 0.4%
986	16.0%	12.5%	14.2%	1997	17.0%	19.4%	19.0%				
1987	11.2%	8.9%	14.0%	2000	15.4%	15.9%	12.7%				

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

20-Year MAPE 5.7% NA NA NA

Uintah County

As a county with an economy based on extraction industries, the population of Uintah County can be hard to predict. Most series under projected the population of Uintah County. The 1984 and 1986 series are the exception, with APEs exceeding 20%. Though under-projected, most series have APEs below 10% between 1990 and 2010. By 2020, five series over projected while six series under projected.

The 1994 baseline most accurately projected the 2020 population with an APE of 2.1%. The 1997 baseline was the

only other series with an APE below 5%. The 2000 baseline least accurately projected the population, with an APE of 18.6%.

The 1994 series most accurately projected the population of Uintah County in the short and medium term, with a 5-year MAPE of 1.5% and a 10-year MAPE of 1.2%. In the long term, the 1988 series performed the best with a 20-year MAPE of 2.2%. The 1986 series performed the worst in the short and medium term, while the 1988 series performed worst in the long term.

Figure 53: APE by Series, Uintah County

Table 25: MAPEs, Uintah County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	5.3%	10.6%	18.4%	1988	3.1%	2.1%	2.2%
1979	12.7%	8.2%	7.6%	1990	6.1%	5.4%	6.1%
1980	17.2%	12.2%	14.7%	1992	3.9%	4.0%	5.9%
1984	14.4%	20.0%	23.5%	1994	1.5%	1.2%	3.5%
1986	26.6%	22.3%	21.7%	1997	2.5%	3.4%	7.6%
1987	3.8%	2.3%	2.5%	2000	4.1%	9.6%	14.9%

Sources: Bureau of Business and Economic Research, University of Utah (1967-1972). Utah Office of Planning and Budget (1975-1992). Governor's Office of Planning and Budget, State of Utah (1994-2012). Kem C. Gardner Policy Institute (2017). Analysis by Kem C. Gardner Policy Institute.

20-Year MAPE 13.5% NA NA NA

Utah County

Most series under projected the population of Utah County. However, several series produced after 2000 over projected the population, particularly the 2008 baseline. The 2005, 2012, and 2017 series all resulted in APEs below 4%.

The 2005 baseline most accurately projected the 2020 population with an APE of 0.4%. The 2012 and 2017 series also received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 53.3%.

The 2012 series most accurately projected the population of Utah County in the short term, with a 5-year MAPE of 0.7%. In the medium and long term, the 1979 series performed the best with a 10-year MAPE of 1.7% and a 20-year MAPE of 3.4%. The 2008 performed worst in the short term, the 1992 worst in the medium term, and the 1988 worst in the long term.

Figure 55: APE by Series, Utah County

Table 26: MAPEs, Utah County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	4.7%	9.3%	16.0%	1988	4.0%	10.2%	20.8%
1979	0.9%	1.7%	3.4%	1990	4.1%	9.6%	18.4%
1980	3.9%	3.3%	4.1%	1992	7.2%	12.4%	19.9%
1984	4.8%	4.4%	11.1%	1994	3.3%	7.3%	14.2%
1986	5.4%	4.0%	14.0%	1997	7.6%	9.9%	12.8%
1987	2.0%	7.2%	18.3%	2000	5.8%	7.8%	9.7%

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2002	4.7%	4.8%	5.0%
2005	1.2%	1.7%	NA
2008	8.6%	9.6%	NA
2012	0.7%	NA	NA

Wasatch County

Most series under projected the population of Wasatch County, with some APEs greater than 40%. However, the 2005, 2008, and 2017 series over project the population.

The 2017 baseline most accurately projected the 2020 population with an APE of 2.2%. The 2008, 2005, and 2012 series also received APEs below 10%. The 1967 baseline least accurately projected the population, with an APE of 74.2%.

The 1984 series most accurately projected the population of Wasatch County in the short term, with a 5-year MAPE of 0.9%. In the medium and long term, the 1980 series performed the best with a 10-year MAPE of 2.9% and a 20-year MAPE of 6.1%. The 2000 baseline performed the worst in the short term, the 1992 series in the medium term, and the 1988 in the long term.

Table 27: MAPEs, Wasatch County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Y MA
1967	10.6%	11.6%	18.7%	1990	7.5%	14.6%	27.2%	2008	
1979	2.4%	2.9%	6.1%	1992	11.1%	17.7%	28.1%	2012	
1980	2.3%	2.9%	6.1%	1994	7.7%	14.1%	23.7%		
1984	0.9%	3.3%	13.7%	1997	8.5%	11.8%	15.6%		
1986	2.7%	7.1%	20.9%	2000	14.5%	15.9%	20.0%		
1987	3.7%	10.4%	24.9%	2002	7.5%	6.8%	9.5%		
1988	5.7%	13.9%	28.3%	2005	3.6%	6.0%	NA		

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
2008	4.8%	3.7%	NA
2012	6.2%	NA	NA

Washington County

In recent decades, Washington County has been a fastgrowing area. However, this growth has not always been as rapid as today. Until the year 2005, all series under projected the population of Washington County. Four series produced after 2000 consistently over projected the population. Of the series that projected between 2010 and 2021, seven produced APEs less than 10%.

The 1997 baseline most accurately projected the 2020 population with an APE of 2.5%. The 2017 and 2002 series also

received APEs below 3%. The 1967 baseline least accurately projected the population, with an APE of 91.8%.

The 1997 series most accurately projected the population of Washington County in the short term, with a 5-year MAPE of 4.9%. In the medium and long term, the 2002 series performed the best with a 10-year MAPE of 6.0% and a 20-year MAPE of 4.2%. The 1967 series performed worst in the short and long term, while the 2002 series performed worst in the medium term.

Table 28: MAPEs, Washington County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	27.6%	35.6%	49.2%	1988	16.2%	27.6%	38.7%	2002	6.9%	6.0%	4.2%
1979	14.8%	24.5%	38.0%	1990	23.9%	31.3%	39.0%	2005	10.0%	19.3%	NA
1980	20.6%	27.5%	39.5%	1992	15.2%	16.8%	20.7%	2008	26.2%	36.7%	NA
1984	18.4%	25.0%	36.7%	1994	11.2%	10.3%	10.6%	2012	5.1%	NA	NA
1986	19.4%	29.6%	40.5%	1997	4.9%	7.7%	5.5%				
1987	11.3%	22.1%	34.7%	2000	11.6%	13.5%	10.2%				

Wayne County

Series that projected from 1980 to 1995 tended to over project the population of Wayne County. Between 1995 and 2010, series both over and under projected. From 2010 until the present all series over projected with several series exceeding APEs of 50%.

The 2012 baseline most accurately projected the 2020 population with an APE of 13.6%. The 2017, 2008, and 1992 baselines were the only other series with APEs below 20%. The 2002 baseline least accurately projected the population, with an APE of 72.0%.

The 1988 series most accurately projected the population of Wayne County in the short term, with a 5-year MAPE of 1.0%. The best medium-term series was the 1987 baseline, with a 10-year MAPE of 3.4%. In the long term, the 1992 series performed the best with a 20-year MAPE of 4.2%. The 1986 series performed worst in the short term, the 1980 series in the medium term, and the 2000 series in the long term.

Figure 61: APE by Series, Wayne County

Table 29: MAPEs, Wayne County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20 N
1967	9.1%	5.8%	14.4%	1990	2.3%	6.0%	
1979	8.9%	17.0%	24.1%	1992	3.2%	5.1%	
1980	9.8%	17.5%	24.3%	1994	5.7%	5.2%	
1984	8.7%	12.9%	12.8%	1997	6.1%	8.4%	
1986	15.5%	15.3%	15.5%	2000	12.3%	16.4%	3
1987	2.1%	3.4%	6.9%	2002	7.9%	13.5%	3
1988	1.0%	4.0%	7.3%	2005	2.8%	7.5%	

Se	ries	5-Year MAPE	10-Year MAPE	20-Year MAPE
20	08	1.6%	5.1%	NA
20	12	3.6%	NA	NA

Weber County

Until the year 1990, all series over projected the population of Weber County, with three series achieving APEs over 30%. Series produced after 1990 under projected the population until the year 2010. Most series produced since 2000 over projected the population. Despite these fluctuations, series produced from the late 1980s and after 1994 have APEs below 10%.

The 2017 baseline most accurately projected the 2020 population with an APE of 1.4%. The 2012, 2000, 2005, and 1994 series also received APEs below 5%. The 1967 baseline least accurately projected the population, with an APE of 19.1%.

The 1988 series most accurately projected the population of Weber County in the short term, with a 5-year MAPE of 1.1%. The best medium-term series was the 2005 baseline, with a 10-year MAPE of 1.2%. In the long term, the 1994 series performed the best with a 20-year MAPE of 1.7%. The 1980 baseline consistently received the highest MAPE, making it the least accurate short, medium, and long-term series.

Table 30: MAPEs, Weber County

Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE	Series	5-Year MAPE	10-Year MAPE	20-Year MAPE
1967	8.3%	13.2%	18.1%	1988	1.1%	2.4%	5.0%	2002	1.1%	2.0%	5.1%
1979	13.1%	20.8%	23.7%	1990	2.2%	5.3%	8.4%	2005	1.3%	1.2%	NA
1980	15.5%	22.0%	24.3%	1992	6.7%	10.1%	12.9%	2008	1.2%	2.6%	NA
1984	6.4%	9.7%	11.5%	1994	1.6%	2.0%	1.7%	2012	2.2%	NA	NA
1986	4.9%	2.5%	3.5%	1997	3.0%	1.7%	3.3%				
1987	1.8%	1.9%	4.2%	2000	6.1%	5.0%	3.5%				

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