

An Evaluation of Population Estimates
Produced by the Ratio-correlation Method
for 254 Counties in Texas with the 2010
Census Counts

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Principles of Population Estimation

- **Population Estimates are generally more accurate:**
- **For geographic areas with larger population than for those with smaller populations.**
- **For total populations rather than for population subgroups because estimates of such characteristics involve additional assumptions that may prove to be in error.**
- **For short rather than long periods of time past the reference date for the base data used in the estimates (i.e. last census).**
- **For areas that show consistency in the direction of change during the estimation period compared to the period from which the base data are derived.**
- **For areas that experience slow rather than rapid change.**
- **If completed with data that directly determines population change (such as data on births, deaths, and migration) rather than when they employ indirect or symptomatic indicators of population change.**

Estimate Error

Estimate error may be defined as the difference between the estimated population for a particular area in a particular year and the actual population for the same area and year:

$$\text{Estimation Error} = \text{Estimate Value} - \text{Census Count}$$

$$\text{Rate (percent) of Error} = \frac{\text{Estimate Value} - \text{Census Count}}{\text{Census Count}}$$

Usually Examine:

- Overall level or rate of estimation error across all areas for which estimates have been made (assuming census counts or other values selected as a standard for comparison are the “correct” values)
- How many geographic areas are estimated within different ranges of error and the number of areas that were overestimated and underestimated compared to census values
- How the error rates vary by selected factors such as:
 - Population size of areas
 - Areas’ rates of population growth
 - For different types or levels of geography (place, county, etc.)

Commonly Used Measures of Error

$$\text{Mean Algebraic Percent Error (MALPE)} = \frac{\sum_{i=1}^n \left(\frac{\text{Estimated Value} - \text{Census Count}}{\text{Census Count}} \right)}{n} \times 100$$

$$\text{Mean Absolute Percent Error (MAPE)} = \frac{\sum_{i=1}^n \left| \frac{\text{Estimated Value} - \text{Census Count}}{\text{Census Count}} \right|}{n} \times 100$$

$$\text{Mean Percent Absolute Difference (MPAD)} = \frac{\sum_{i=1}^n |\text{Estimated Value} - \text{Census Count}|}{\sum_{i=1}^n \text{Census Count}} \times 100$$

Table 1: Mean Algebraic Percent Error (MALPE), Mean Absolute Percent Error (MAPE), and Mean Percent Absolute Difference (MPAD) between 2010 Census Counts and Population estimates produced by Ratio-correlation Method for 254 Counties in Texas

Population Size, 2010	Number of Counties	MALPE	MAPE	MPAD
Under 1,000	8	27.80	30.51	33.44
1,000 - 2,499	16	17.17	17.91	17.13
2,500 - 4,999	27	12.67	13.13	12.88
5,000 - 9,999	35	8.22	9.59	9.38
10,000 - 24,999	68	8.23	8.53	8.33
25,000 - 49,999	38	4.65	5.54	5.38
50,000 - 99,999	23	5.29	6.48	6.59
100,000 and over	39	-0.30	2.95	2.64
All Counties	254	7.77	8.96	3.43

Table 2: Mean Algebraic Percent Error (MALPE), Mean Absolute Percent Error (MAPE), and Mean Percent Absolute Difference (MPAD) between 2010 Census Counts and Population estimates produced by Ratio-correlation Method for 254 counties in Texas by Percent Population Change, 2000-2010

Percent Population Change, 2000-2010	Number of Counties	MALPE	MAPE	MPAD
<-10.00	22	20.91	20.91	16.65
-10.00 - 00.00	57	12.05	12.49	9.40
00.00 - 09.99	97	7.53	7.83	3.85
10.00 - 19.99	41	4.47	5.04	3.06
20.00 - 29.99	18	-0.54	2.61	2.08
30.00 - 30.99	9	-1.86	3.30	1.68
40.00 - 49.99	3	-4.30	4.30	3.05
50.00 +	7	-6.93	6.93	6.52
All Counties	254	7.77	8.96	3.43

Table 3: Range of Percent Error for Differences Between 2010 Census Counts and Estimated Population produced by Ratio-correlation Method for 254 Counties in Texas

Range of Error	Frequency	Percent
00.0-04.9	94	37.01
05.0-09.9	80	31.50
10.0-14.9	40	15.75
15.0-19.9	18	7.09
20.0-24.9	8	3.15
25.0-29.9	5	1.97
30.0+	9	3.54

Figure 3: Percent Error from Comparison of Population Estimates Produced by Ratio-Correlation Method and 2010 Census Counts

