

# appendix d

## population projections

This appendix explains the processes that were used to determine population projections for the City of Prattville. Three processes were used: (a) mathematical extrapolation, (b) linear regression, and (c) constant share. Each of these processes has its strengths and weaknesses for providing accurate and reliable projections. The details are provided in each section. In the end, an average of the results of each of the three processes was used as the population projections for Prattville.

### *method a:* *mathematical* *extrapolation*

The mathematical extrapolation formula supplies an estimate of the average annual growth rate which is used to predict the population change in the future. The growth rate is derived from the formula below:

1. ratio of most recent to next most recent census count
2. natural logarithm of line 1
3. annual growth rate (line 2/times

between census)

4. Elapsed time between the most recent census date and date of the projection - measured in years and fractions of years.
5. Average annual growth rate multiplied by the elapsed time
6. Exponential of line 5 using base of natural logarithms
7. Population estimate equals line 6 x most recent census figure.

### *weaknesses:*

1. This method is less accurate as you move further from the most recent census.
2. Works best in areas which have had relatively stable change.

### *method b:* *linear regression*

The linear regression model is one of many available curve fitting techniques. Curve fitting models attempt to identify the mathematical relationship which best describes past trends and then continues the

relationship to predict future trends. In the case of linear regression, the trend is mapped as a straight line using the formula below:

$Y = a + bX$ , where  
 Y = Population for the given Census  
 a = intercept of the Y axis  
 b = slope of the line  
 X = Year of the Census

$$b = \frac{N \sum XY - (\sum X)(\sum Y)}{N \sum X^2 - (\sum X)^2}$$

$$a = \text{mean of } Y - b(\text{mean of } X)$$

*Note: N is the number of cases*

Example:

X	Y	X <sup>2</sup>	XY
1960	6,616	3,841,600	12,967,360
1970	13,116	3,880,900	25,838,520
1980	18,647	3,920,400	36,921,060
1990	19,587	3,960,100	38,978,130
7900	57,966	15,603,000	114,705,070

$$b = \frac{N \sum XY - (\sum X)(\sum Y)}{N \sum X^2 - (\sum X)^2}$$

$$b = \frac{4(114,705,070) - (7900)(57,966)}{4(15,603,000) - (7900)^2}$$

$$b = \frac{458,820,280 - 457,931,400}{62,412,000 - 62,410,000}$$

$$b = \frac{888,880}{2,000}$$

$$b = 444.44$$

$$a = \text{mean of } Y - b(\text{mean of } X)$$

$$a = 14,491.5 - 444.44(1975)$$

$$a = 14,491.5 - 877,769$$

$$a = -863,277.5$$

Project the population of Prattville in the year 2000.

$$Y = a + bX$$

$$Y = -863,277.5 + 444.44(2000)$$

$$Y = -863,277.5 + 888,880$$

$$Y = 25,602$$

*weaknesses*

1. Linear regression assumes that the population will change by equal amounts over equal time periods.
2. Periods of extraordinary growth or contraction in the reference data may cause the projection to give an unrealistic projection.

*method c:*

*constant share*

The constant share method assumes that the city's population will remain a constant share of the population of its larger region; in this case the county. The method assumes that since Prattville comprised x percentage of the Autauga County and Elmore County population in the last Census, then Prattville continue to comprise that percentage of the two county's population. Population projections from the Center for Business and Economic Research, University of Alabama were used to derive projections for Prattville. The following is the formula that is used.

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1990 Census Elmore County:	49,210
1990 Census Autauga County:	34,222
1990 Census Prattville (Elmore Co):	709
1990 Census Prattville (Autauga Co):	18,878
Prattville percentage of Elmore County:	1.4%
Prattville percentage of Autauga County:	55.2%
1995 CBER projection Elmore County:	51,888
1995 CBER projection Autauga County:	35,313
1995 Prattville projection (Elmore County projection * 1990 percentage of Elmore Co):	748
1995 Prattville projection (Autauga County Projection * 1990 percentage of Autauga Co):	19,480
Total Prattville 1995 projection:	20,227

*weaknesses*

1. The method assumes that the city will remain a constant share of the region which may not be true for a city which has experienced rapid growth or contraction in the past.
2. Municipalities have the ability to rapidly change their geographic boundaries through annexation which can dramatically increase the city's share of its region.

