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Enrollment Projections to 2025: Brookings School District, SD

State Census Data Center
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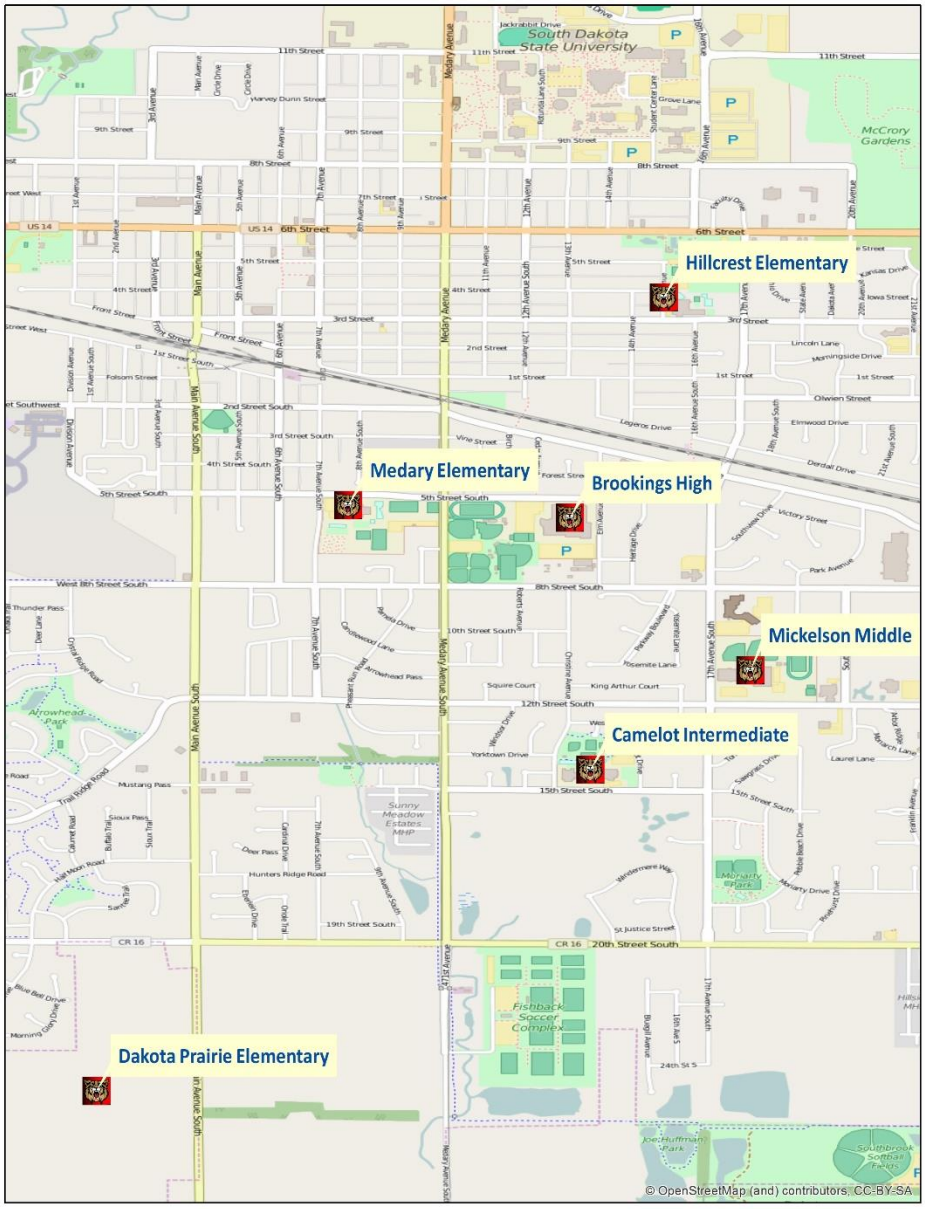

STATE DATA CENTER

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Dr. Weiwei Zhang

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ABOUT THIS REPORT

This report has four parts. The first section is a summary of findings for the K-12 enrollment in the Brookings School District between 1999 and 2015 and the projections to the year of 2025.

The second section describes the enrollment trend of k-12 students at Brookings School District from 1999 to 2015. The data are provided by the district. [1] Time trends in the historical enrollment data and factors such as natural increase/decrease and migration that have influenced the enrollment are discussed. Understanding time trends and the related factors are critical for making the projections.

The third section provides projections by grade and year. Discussions of projection assumptions, limitations, and potential adjustments are included.

The fourth section includes maps showing the distribution of population and families with children at the Census block level and changes in the past decade on the block and block-group levels in Brookings School District. Demographic trends within the school district illustrated in the maps offer an overview of the geographic arrangement of the population and families within the school district. In addition, population projections to 2035 and population pyramids by age and gender for Brookings County are included in the last section.[2]

[1] South Dakota Department of Education (DoE) reports k-12 enrollment by grade and school. After comparing the two datasets, I chose the data provided by the district because it is more complete and contemporary than the data from the DoE. Comparisons between these two datasets are available upon request.

[2] The projections were created by the Center staff in 2013 using the 2010 decennial Census population figures as the base counts under the contract with the State Governor's office.

REPORT SUMMARY

Historical and Contemporary Enrollments

- Brookings School District enrollment increased by 544 students or 19.4 percent between 1999 and 2015.
- The growth is largely driven by natural increase. The segment of K-4 were in a continuous trend of increasing throughout the period between 1999 and 2015; the segment of Grade 5-8 was stable till 2008 and 2009 and began to increase afterward; the segment of Grade 9-12 started to pick up the pace of increasing in a few of years recently.
- The increasing trend of K-4 enrollment was a product of the rising Brookings County resident births as well as the district's fluctuating yet on average growing share of kindergarten cohort pool.

Enrollment Projections to 2025

- It is projected that the enrollment between 2025 and 2015 is increased by 557 students or 16.6 percent. The annual growth rate between 2015 and 2025 is estimated at 1.6 percent on average.
- The growth is attributed to increases in all three segments' student populations including Grade K-4, Grade 5-8, and Grade 9-12. Increases in Grade 5-8 and 9-12 are estimated at a high rate compared to the increase in K-4, reflecting the relatively larger K-4 cohort in previous years.

Population Distribution and Growth in the Community

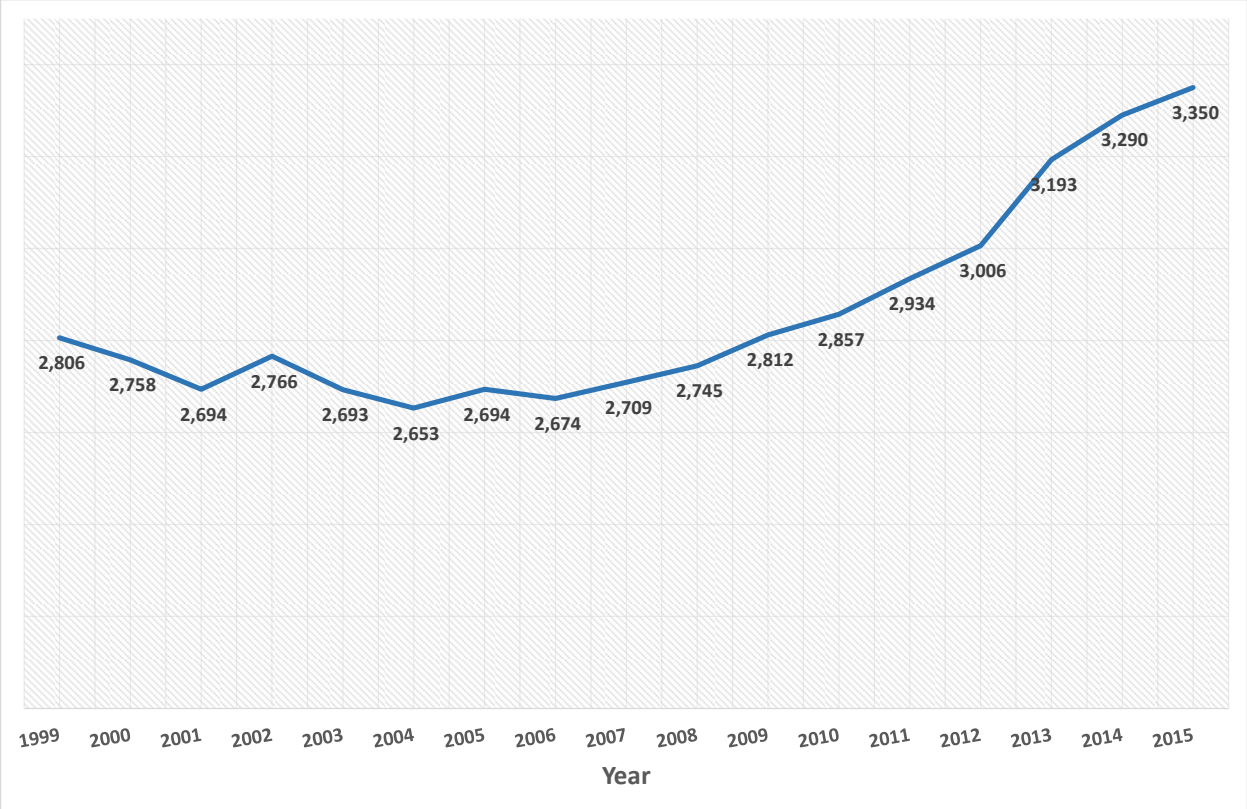
- The maps of population distribution and growth in the communities within the school district show that in the past few years the clusters of residential population are mostly in the city of Brookings, with a few pockets of population growth occurred in the east and south parts of the district including areas beyond the 32nd St S and the town of Aurora.
- The maps that illustrate the distribution of families with children in local communities in 2010 show that in the city of Brookings most of families with children under age 17 resided in the south and southwest parts of the city and families with children in communities outside of the city were found in the town of Aurora and areas to the south of the 32nd St S; breaking down families by children's age, the patterns vary slightly.

BROOKINGS SCHOOL DISTRICT ENROLLMENT: 1999-2015

Enrollment Trends

Enrollment in the Brookings Public Schools is 544 students or 19.4 percent higher in 2015 than in 1999. Figure 1 illustrates the enrollment trends over this period. The enrollment started with a total number of 2,806 in the year 1999 and experienced an overall pattern of decrease at the rate of 1-3 percent to the year of 2006 (except two periods 2001-2002 and 2004-2005, which experienced some increase in enrollment). After that, the enrollment started to increase and such an increasing trend was stable around 1-3 percent for the next few years. Between 2012 and 2013 the trend picked a rate of 6.2 percent increase and scaled down to 1-2 percent afterward.

Figure 1. K-12 Enrollment from 1999 to 2015



Enrollment Components

To better understand enrollment change, it is important to understand the components of change. Two major components worth noting: kindergarten cohort and grade progression. If we take the K-12 enrollment as analogy to a population, natural increase/decrease in the enrollment population can be measured by taking the difference between the kindergarten cohort of year (t) and the Grade 12 cohort of year (t-1). Net migration can be measured by the grade progression. The assumption is that the Grade (g) cohort of year (t-1) progresses to the Grade (g+1) in year (t) with no drop-outs. For example, a larger number in the Grade 12 cohort of year (t) compared to the Grade 11 cohort of year (t-1) indicates there was a net gain due to migration or open enrollment; a smaller number would indicate there was a net loss.

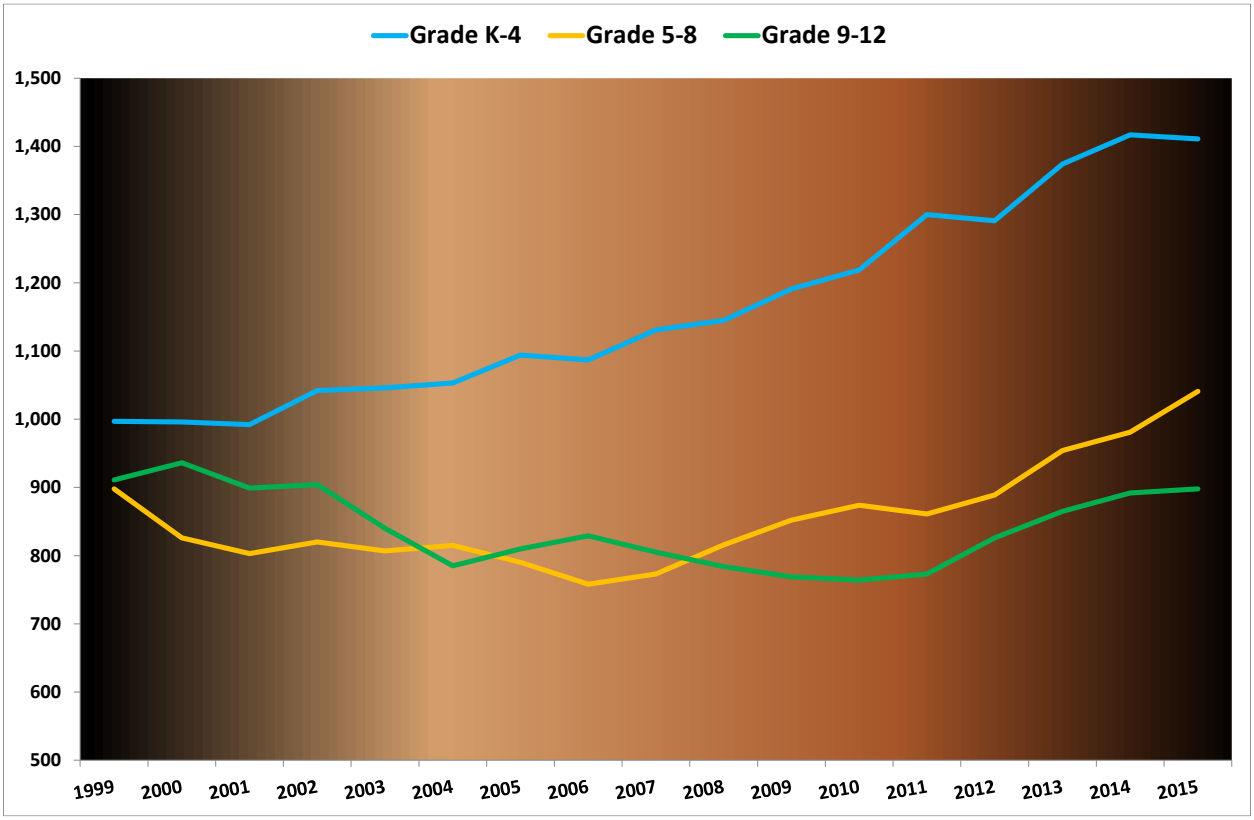
Table 1. Components of Enrollment Changes: Natural Increase/Decrease and Net Migration

Year (t)	Enrollment Difference Between Year(t) and Year(t-1)	%Enrollment Difference Between Year(t) and Year(t-1)	Natural Increase/Decrease Between Year(t) and Year (t-1)	Net Migration Between Year(t) and Year(t-1)
2000	-48	-1.7%	-35	-13
2001	-64	-2.3%	-17	-47
2002	72	2.7%	13	59
2003	-73	-2.6%	11	-84
2004	-40	-1.5%	-22	-18
2005	41	1.5%	64	-23
2006	-20	-0.7%	25	-45
2007	35	1.3%	27	8
2008	36	1.3%	73	-37
2009	67	2.4%	43	24
2010	45	1.6%	48	-3
2011	77	2.7%	72	5
2012	72	2.5%	93	-21
2013	187	6.2%	177	10
2014	97	3.0%	98	-1
2015	60	1.8%	96	-36

The decomposition of changes in the enrollment over time into natural increase and grade progression is shown in Table 1. The Second column in Table 1 is the difference in enrollment numbers between two consecutive school years. The third column reports the change in percentage. For example, the 2000 enrollment was 48 lower than the 1999 enrollment. Between 1999 and 2000 there was a decrease in the total enrollment by 1.7

percent. The last two columns show the difference in the enrollment due to natural increase and net migration. It is clear that enrollment changes in the Brookings School District, especially the continuous increase in recent years, were attributed more to the natural increase than to the net migration. Figure 2 below shows the enrollment trend for Grade k-4, 5-8 and 9-12 respectively. Although the latter two groups are picking up the race, the K-4 group undoubtedly exhibits the fast growth trend.

Figure 2. Enrollment Trend by Grade Groups between 1999 and 2015



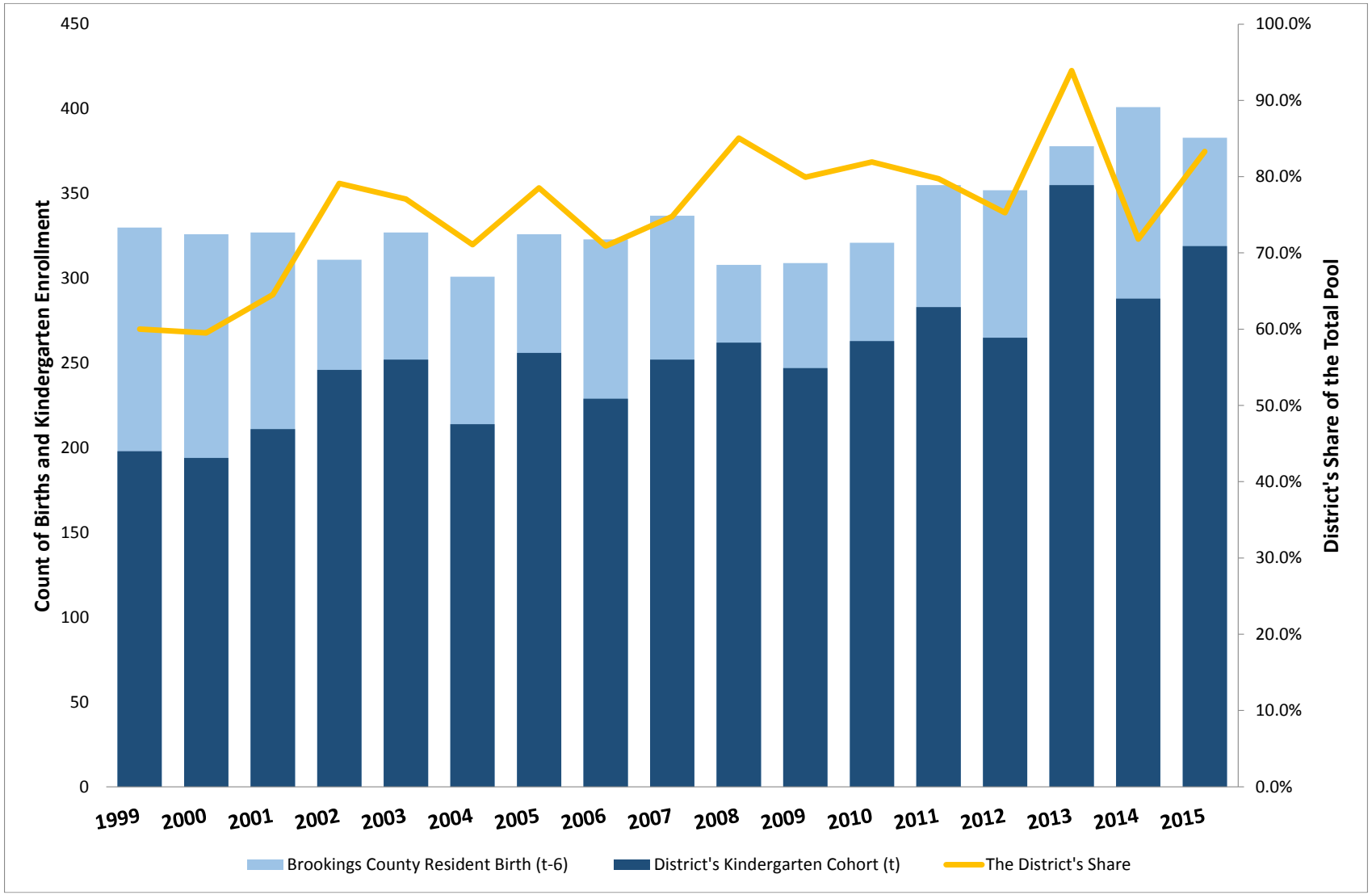
We would then ask whether the natural increase was caused by more births or the district's increasing share of kindergarten-age children in the area. To measure that, Brookings County resident birth in year (t) is used as a proxy for the pool of potential kindergarten enrollment of year (t+6) in Brookings School District.[3] In this way, the district's "market share" from 1999 to 2015 is calculated. Table 2 and Figure 3 present the results. Brookings County resident births overall have increased steadily. The growth of kindergarten enrollment in Brookings School district is a result of the birth growth and the District's gradually increasing share between 1999 and 2015 (Figure 3).

[3] Historical data of Brookings County resident births are provided by South Dakota Department of Health. Special thanks to Carrie Cushing in the Department.

Table 2. Brookings County Resident Birth from 1993 to 2009, Kindergarten Cohort Enrolled in the Brookings School District from 1999 to 2015, and the District's Share

Brookings County Resident Birth		Brookings School District's Kindergarten Cohort		
Year	Count	Year	Count	Share
1993	330	1999	198	60.0%
1994	326	2000	194	59.5%
1995	327	2001	211	64.5%
1996	311	2002	246	79.1%
1997	327	2003	252	77.1%
1998	301	2004	214	71.1%
1999	326	2005	256	78.5%
2000	323	2006	229	70.9%
2001	337	2007	252	74.8%
2002	308	2008	262	85.1%
2003	309	2009	247	79.9%
2004	321	2010	263	81.9%
2005	355	2011	283	79.7%
2006	352	2012	265	75.3%
2007	378	2013	355	93.9%
2008	401	2014	288	71.8%
2009	383	2015	319	83.3%

Figure 3. The Increasing Kindergarten Enrollment as a Result of Increasing Births in the County as well as the Growing Share



PROJECTIONS OF THE ENROLLMENT TO 2025

To conduct projections, we need to evaluate the trend from the past and set up a model with parameters, which would provide a close-to-best fit of the trend. We then adopt the parameter for predicting future trends holding the assumption that these parameters would fit in future trends.

A grade progression rate method is used to project enrollments in grades 1 through 12. For example, the rate of progression from grade 8 to grade 9 is the current year's grade 9 enrollment expressed as a percentage of the previous year's grade 8 enrollment. [4] For each progression from one grade to the next grade, sixteen time points from the actual data of 2000 and 2015 enrollment are derived. Single exponential smoothing is used to generate a constant grade progression rate for each grade for the forecast period. Compared to other methods, this approach takes into account all data points and generates a time-smoothed value that is adaptive to the trend. The constant grade progression rate is then used for calculating enrollment in each grade for each year in the forecast period. Table 3 shows the actual grade progression rate and the adaptive rate used for the projections.

Table 3. Grade Progression Rate

Year	K to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to 12
2000	0.985	0.957	1.005	0.980	1.033	0.978	1.009	0.985	0.972	1.036	0.996	1.009
2001	0.974	0.944	1.015	0.990	0.995	0.973	0.982	0.936	1.015	0.988	0.974	0.991
2002	0.995	1.005	1.038	1.020	1.024	1.040	1.006	1.009	1.039	1.035	0.992	1.086
2003	0.894	1.000	0.958	0.953	0.966	1.033	0.995	1.011	0.954	0.949	0.919	0.983
2004	0.925	1.014	0.976	0.978	1.027	1.005	1.014	1.005	1.011	1.000	0.975	1.000
2005	0.953	0.953	0.964	0.961	1.051	1.005	1.025	0.950	0.971	1.005	1.043	1.030
2006	0.883	0.966	1.027	0.963	1.010	0.947	0.989	0.961	1.014	0.980	1.032	1.032
2007	0.948	1.009	1.030	1.013	1.010	1.010	1.023	0.978	1.020	1.005	1.020	0.979
2008	0.940	0.982	1.013	0.995	0.961	1.019	0.990	1.006	0.934	1.005	0.972	1.015
2009	0.973	1.013	1.014	1.009	1.030	1.027	1.005	1.015	1.027	0.988	0.990	1.029
2010	0.992	1.004	0.992	1.005	0.974	0.981	0.974	1.033	0.975	1.011	0.994	1.060
2011	0.973	1.029	1.012	1.050	0.968	0.978	1.010	1.005	1.009	0.995	0.963	1.030
2012	0.951	0.988	0.980	0.992	0.972	1.029	1.014	0.995	1.022	1.009	0.995	0.978
2013	0.936	1.007	1.028	0.972	1.043	1.021	0.972	1.013	1.093	1.018	0.973	0.974
2014	0.930	1.024	1.030	1.023	1.021	0.981	1.020	1.048	1.035	0.955	0.944	1.018
2015	0.837	0.979	0.984	0.996	1.004	1.029	1.015	1.008	1.136	0.983	0.944	0.977
Average	0.943	0.992	1.004	0.994	1.006	1.003	1.003	0.997	1.014	0.998	0.983	1.012
Highest	0.995	1.029	1.038	1.050	1.051	1.040	1.025	1.048	1.136	1.036	1.043	1.086
Lowest	0.837	0.944	0.958	0.953	0.961	0.947	0.972	0.936	0.934	0.949	0.919	0.974
Adaptive	0.878	0.998	1.002	0.998	1.010	0.999	1.005	1.014	1.073	1.000	0.984	1.014

[4] For detailed discussions of the method, please refer to http://nces.ed.gov/pubs2014/2014051.pdf

The projections of kindergarten enrollment in Brookings School District to 2020 and the projections to 2025 are generated respectively (Table 4). First, based on the historical data of the district's share of Brookings County resident births (See Table 2), we can derive the adaptive share. For the projections to 2020, we can simply apply the adaptive to the actual births in years between 2010 and 2014 and get the projected kindergarten enrollment in years between 2016 and 2020. For the projections to 2025, we need to make projections of the births, which are based on the size of the women population of childbearing age and the fertility rates. These data are available upon request. The projections of births are used for the projections of kindergarten enrollment to 2025. These projected numbers of kindergarten enrollment are then used together with the grade progression rates for the projections of higher grades in the next years.

Table 4. The Projections of Kindergarten Enrollment to 2025

Projected Kindergarten Cohort based on Actual Births			
Year	Actual Births	Year	Projected K
2010	379	2016	306
2011	385	2017	311
2012	404	2018	326
2013	430	2019	347
2014	406	2020	328
Projected Kindergarten Cohort based on Projected Births			
Year	Projected Births	Year	Projected K
2015	398	2021	321
2016	410	2022	331
2017	427	2023	345
2018	427	2024	345
2019	422	2025	341

Finally, the projections of the K-12 enrollment in Brookings School District to 2025 are presented in Figure 4. (The numbers are stored in Table 5.) The solid line presents the actual observed trend and the dotted line graphs the projected trend. The district's K-12 enrollment is projected to increase by 557 students or 16.6 percent between 2015 and 2025. The annual growth rate between 2015 and 2025 is estimated at 1.6 percent. Projected enrollments by K, K-4, 5-8, and 9-12 respectively are shown in Figure 5. The part of the lines in the shaded area represents the projected trend. It shows that all groups are expected to grow, but at different pace. The grade 5-8 and 9-12 enrollments pick up the increasing rate in the projected trends

Figure 4. Actual and Projected K-12 Enrollment Trend, from 1999 to 2025

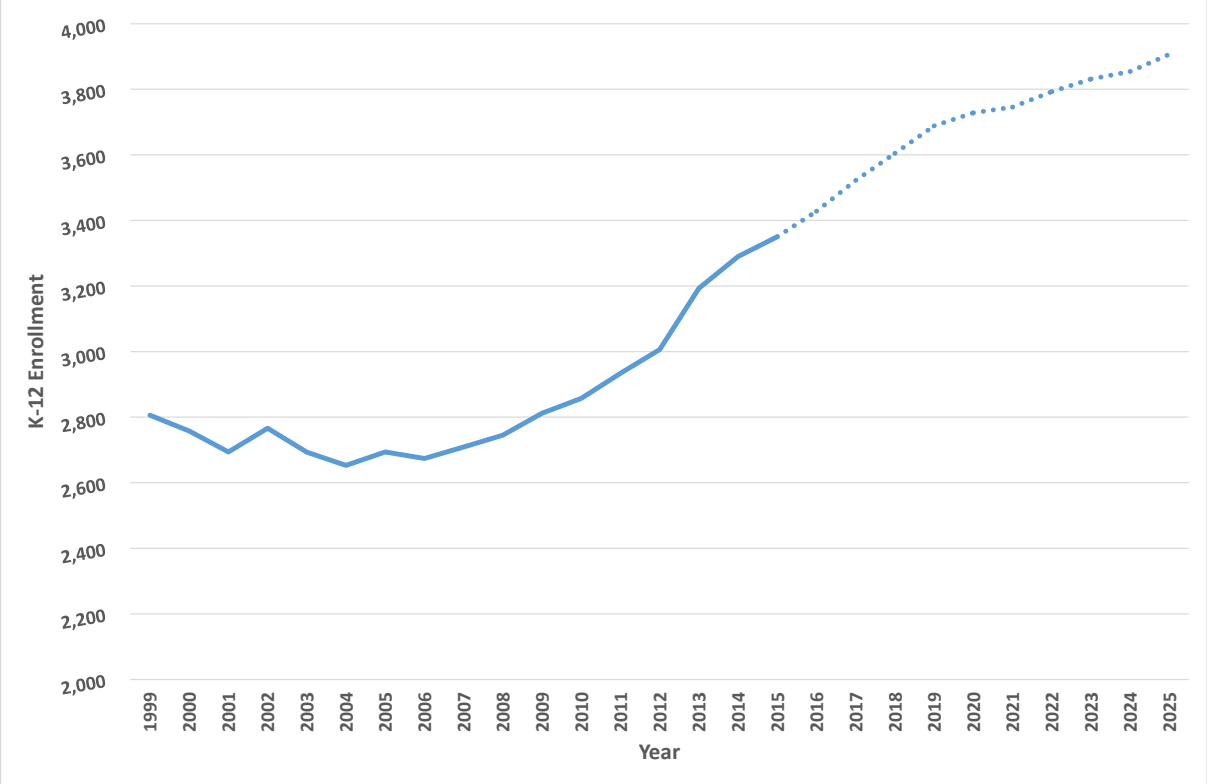
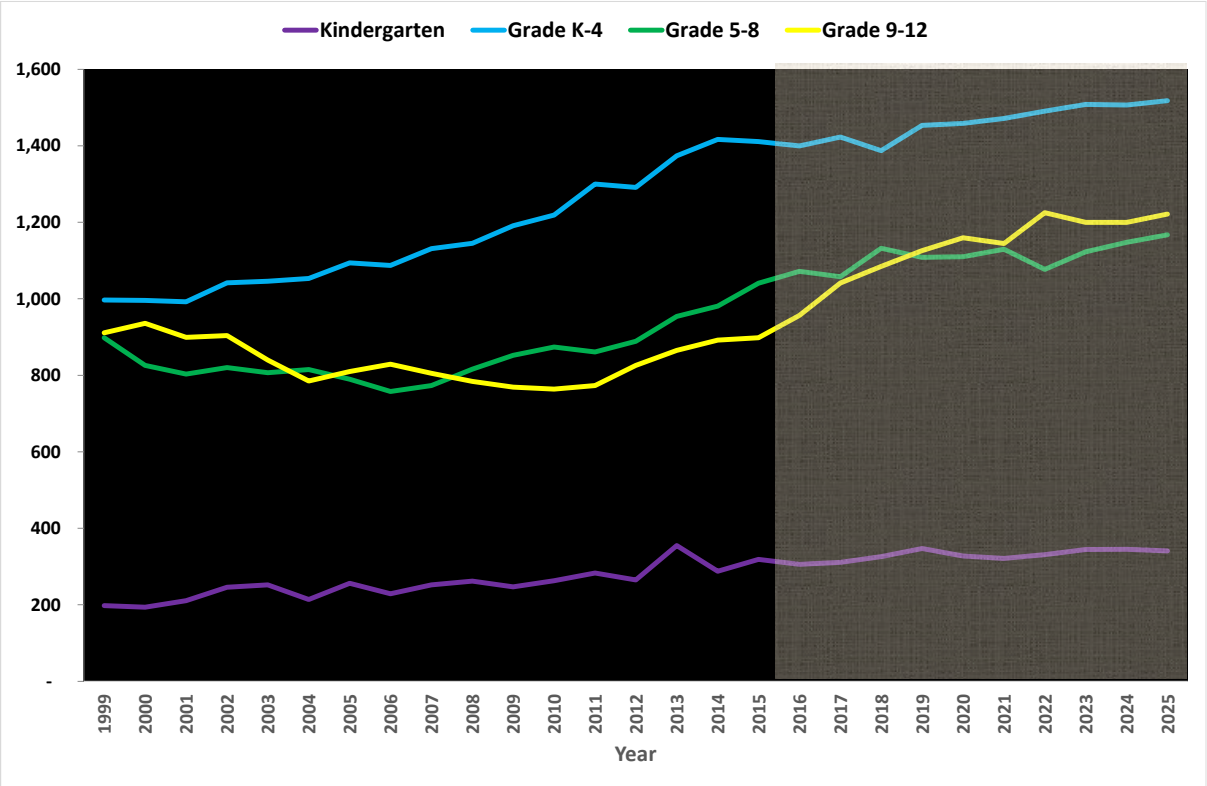


Figure 5. Actual and Projected K-12 Enrollment Trend by Grade Groups, from 1999 to 2025



because of the relatively fast increasing K-4 cohort in previous years. We take the projected number of a single grade enrolment as an example from. The projected number of Grade 12 enrollment in 2025 is 356, reflecting the large Grade 2 enrollment in 2015 (N=323) that is 27 percent higher than the Grade 2 enrollment in 2014 (N=254).[5]

Table 5. Projected Numbers of the K-12 Enrollment to 2025 by Grade

Year	K-12	K	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
2016	3,428	306	280	241	324	250	281	267	253	271	274	250	228	205
2017	3,522	311	268	279	241	323	252	281	268	257	291	274	246	231
2018	3,604	326	273	268	280	241	326	252	282	272	276	290	269	249
2019	3,688	347	286	272	268	279	243	326	253	286	292	276	286	273
2020	3,728	328	305	286	273	268	282	243	328	257	307	292	271	290
2021	3,746	321	288	304	286	272	271	282	244	332	276	307	287	275
2022	3,793	331	282	287	305	286	275	271	284	248	357	276	302	291
2023	3,831	345	291	282	288	304	289	275	272	288	266	357	271	306
2024	3,854	345	302	290	282	287	307	288	276	276	309	266	351	275
2025	3,907	341	303	302	291	282	290	307	290	280	296	309	261	356

POPULATION CHANGE AND DISTRIBUTION IN THE LOCAL COMMUNITY

Contemporary Population Distributional Pattern within the District

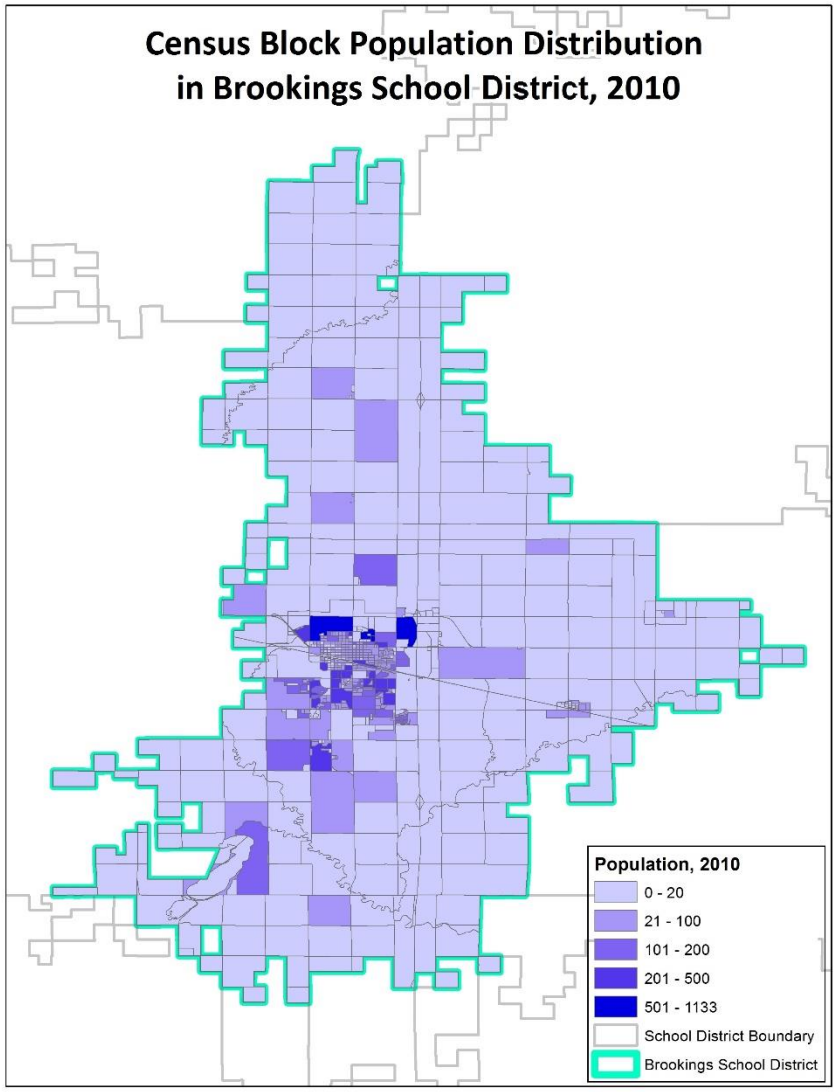
Two maps paralleled in Figure 6 illustrate the contemporary geographic pattern of population distribution at the Census Block level, with darker shades denoting larger resident population. The data are gathered from the decennial 2010 Census.[6] The map on the left shows population distribution at the block level within the entire boundary of Brookings School District. The map on the right shows population distribution in blocks in the area around the City of Brookings with the five schools geocoded on the map.

Two maps paralleled in Figure 7 show the changes in population distribution at the Census Block-Group level, with brown-red shades denoting increases and blue shades denoting decreases. Changes in population figures are derived from the 2006-2010 5 year American Community Survey (ACS) and the 2009-2013 5 year estimates.[7] The map on the left shows the population change in percentage and the map on the right shows the population change in number. Both maps deliver a similar message: communities immediately to the south the City

[5] Historical and current enrollment by grade data are available upon request.
[6] Population figures at the Census Block level are only available from the decennial census.
[7] The availability and reliability of 1 year, 3 year, and 5 year population estimates provided by the American Community Survey depends on the size of geography (population estimates are not available for Census Block). In general we use 5 year estimates for small geographies and geographies with a small size of population.

of Brookings and communities to a less degree from the east side of the City of Brookings had relatively larger increases in population compared to the rest.

Figure 6. Population Distribution at the Census Block Level within Brookings School District: the Decennial 2010 Census data



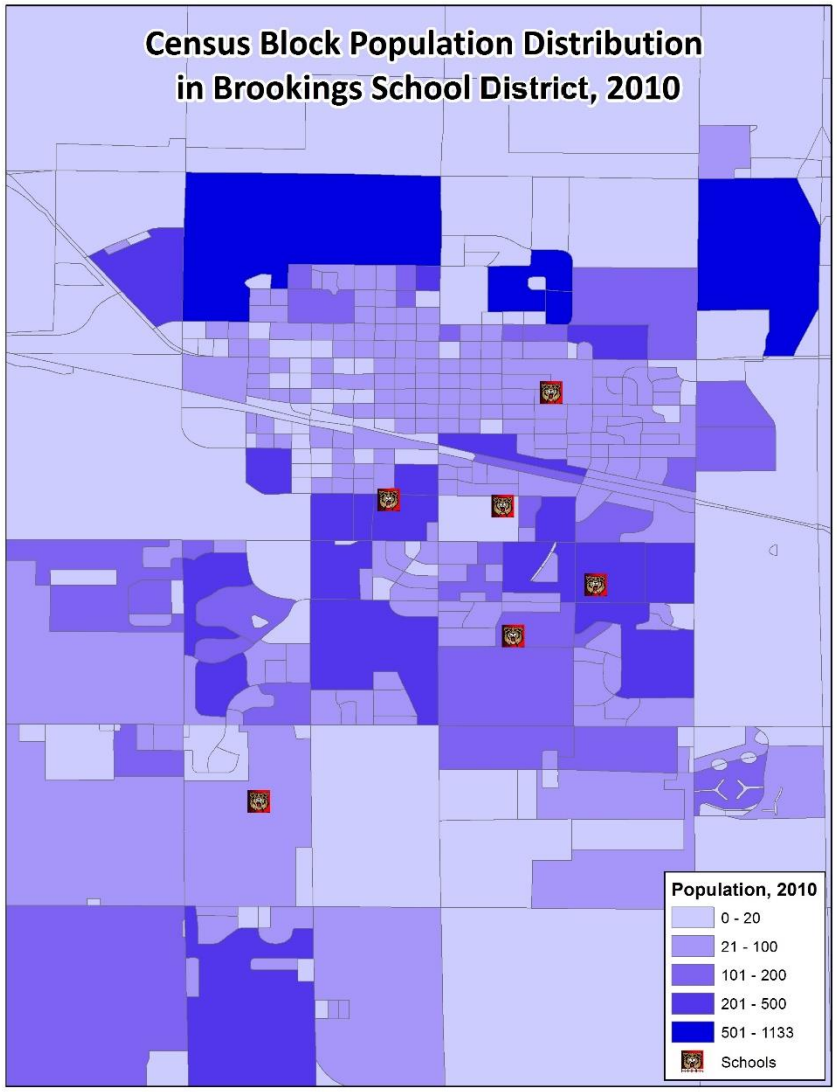


Figure 7. Distribution of Families with Children at the Census Block Level within Brookings School District: the Decennial 2010 Census data

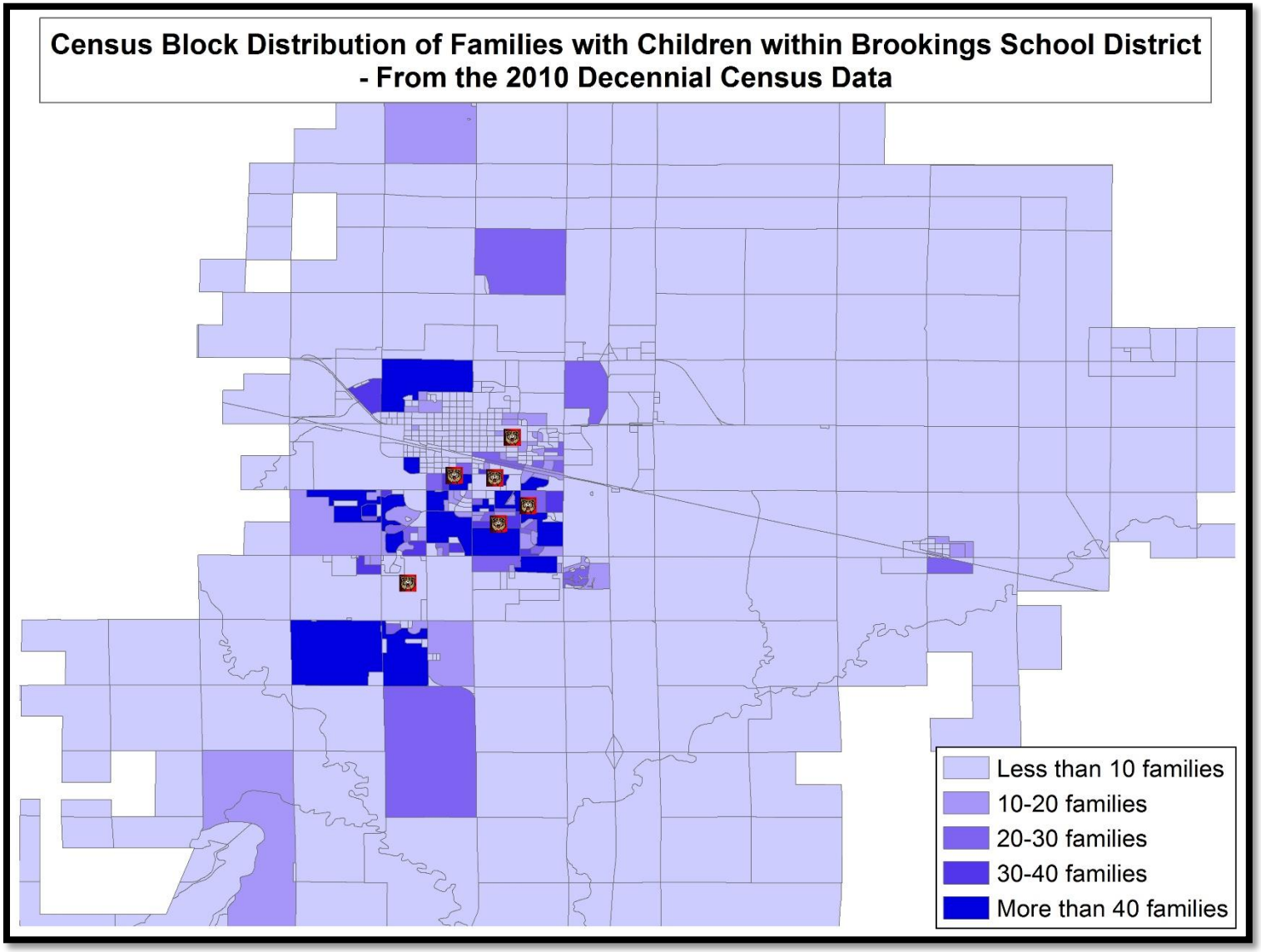


Figure 8. Distribution of Families with Children by Children's Age at the Census Block Level within Brookings School District: the Decennial 2010 Census data

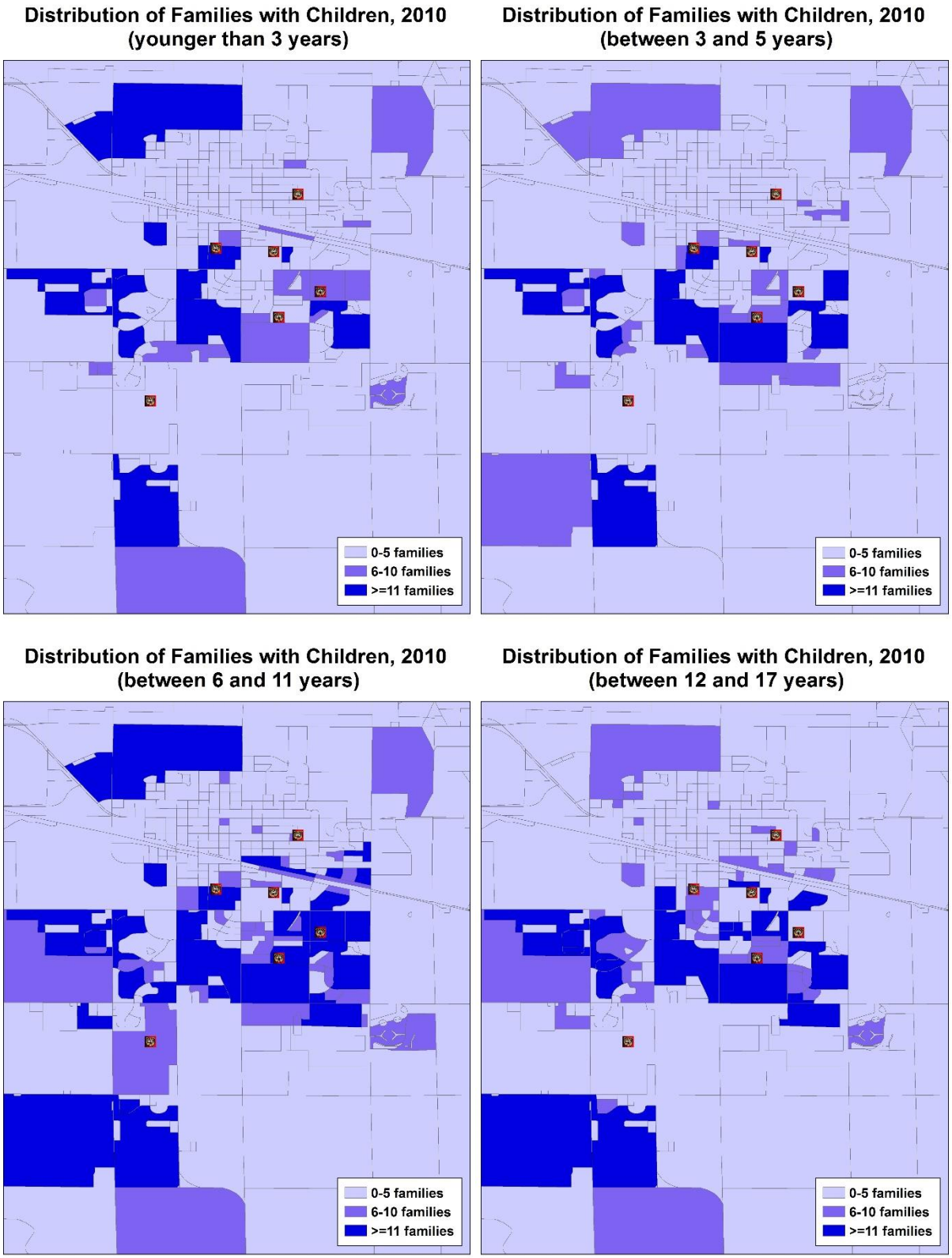
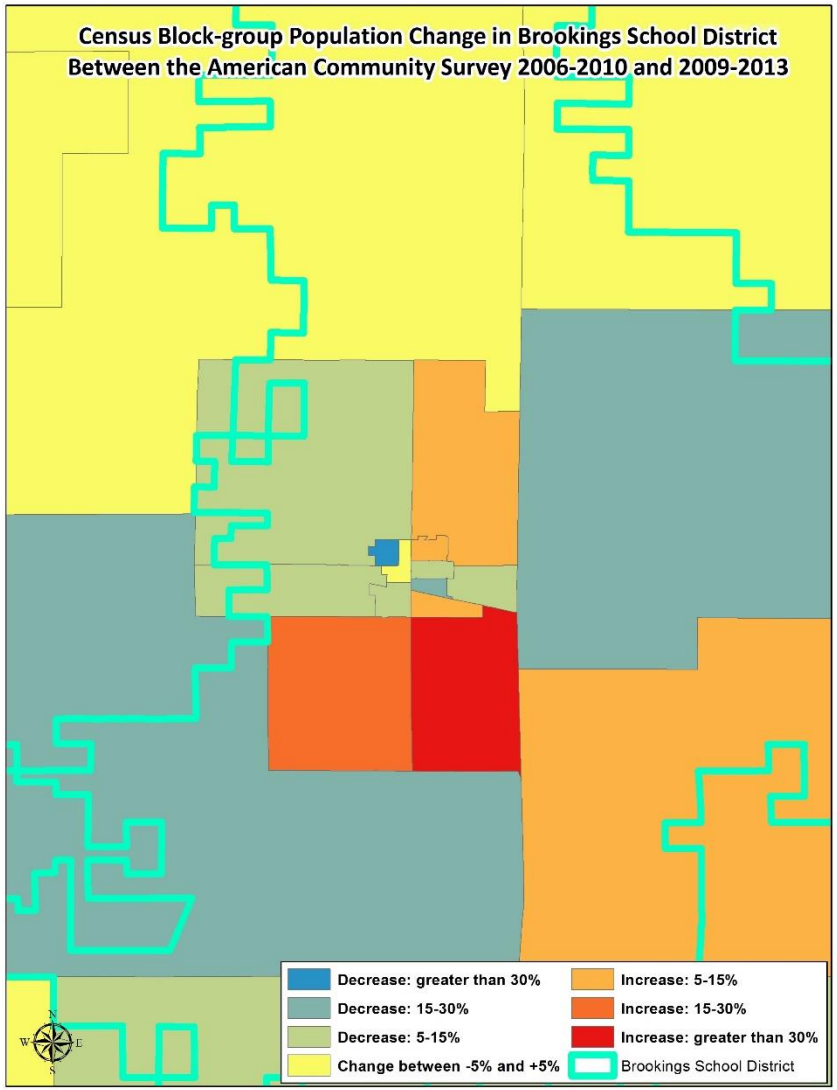
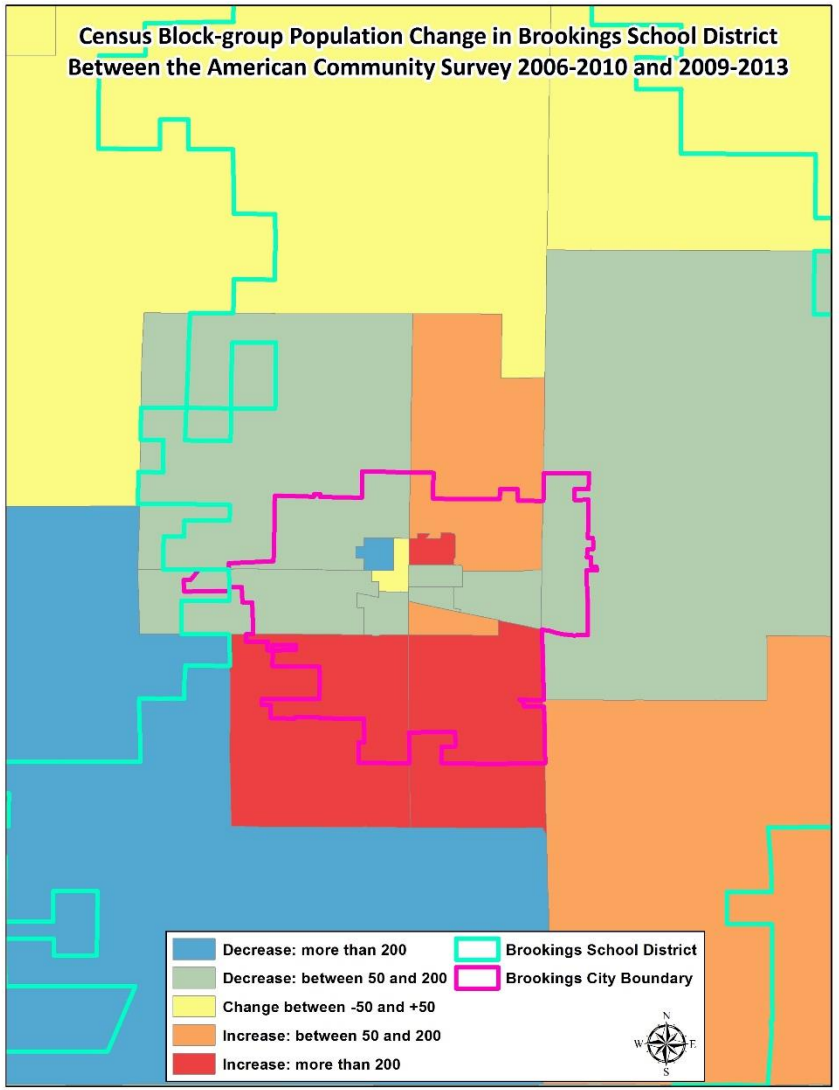


Figure 9. Population Change at the Census Block-Group Level within Brookings School District: the 2006-2010 and the 2009-2013 ACS Data

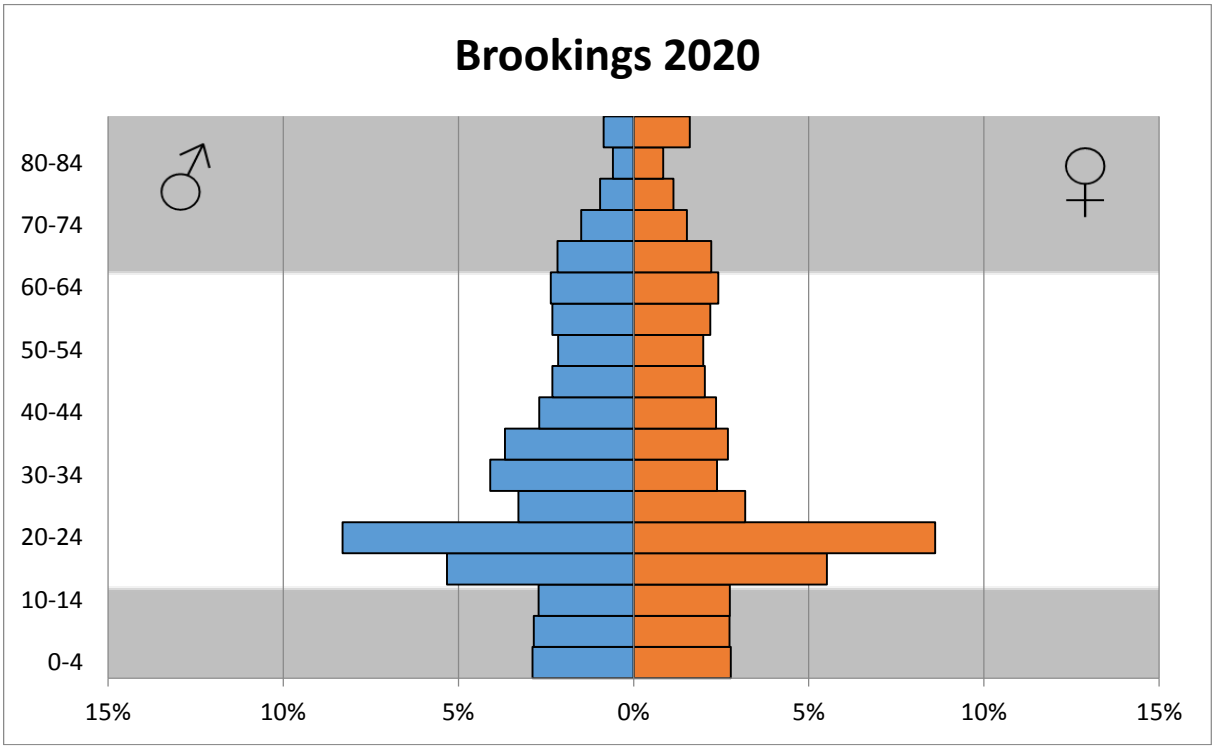


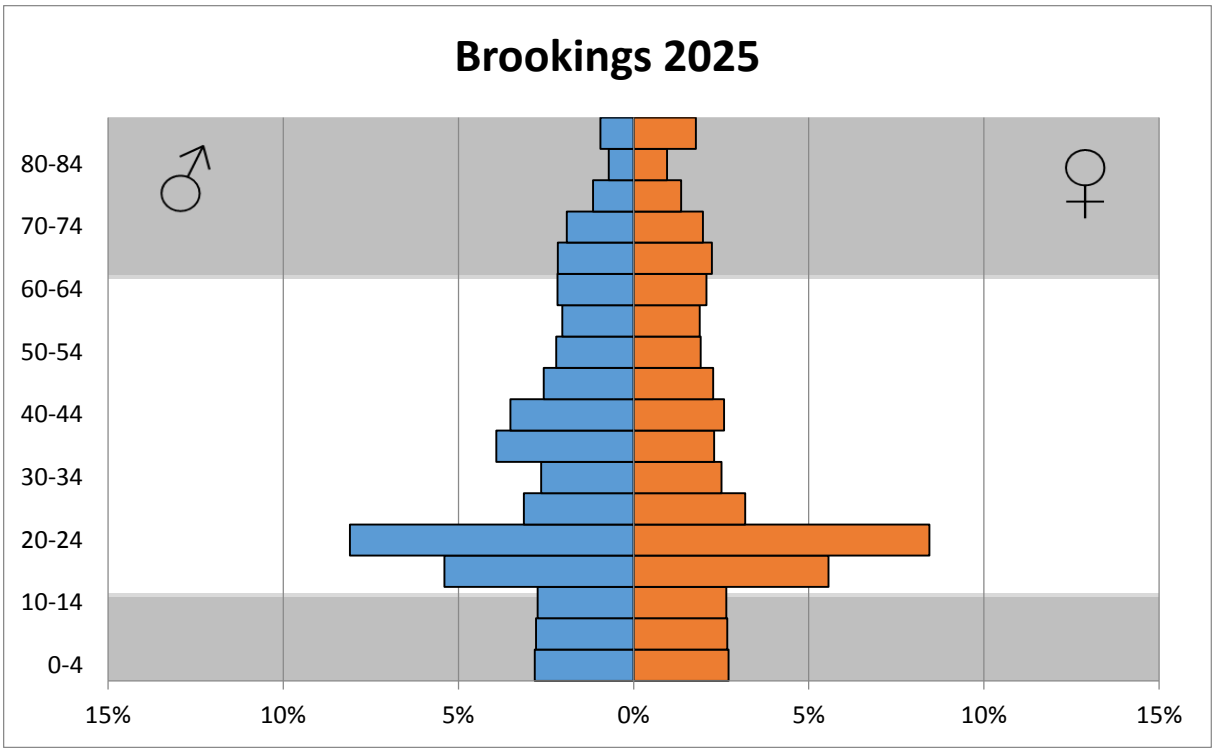


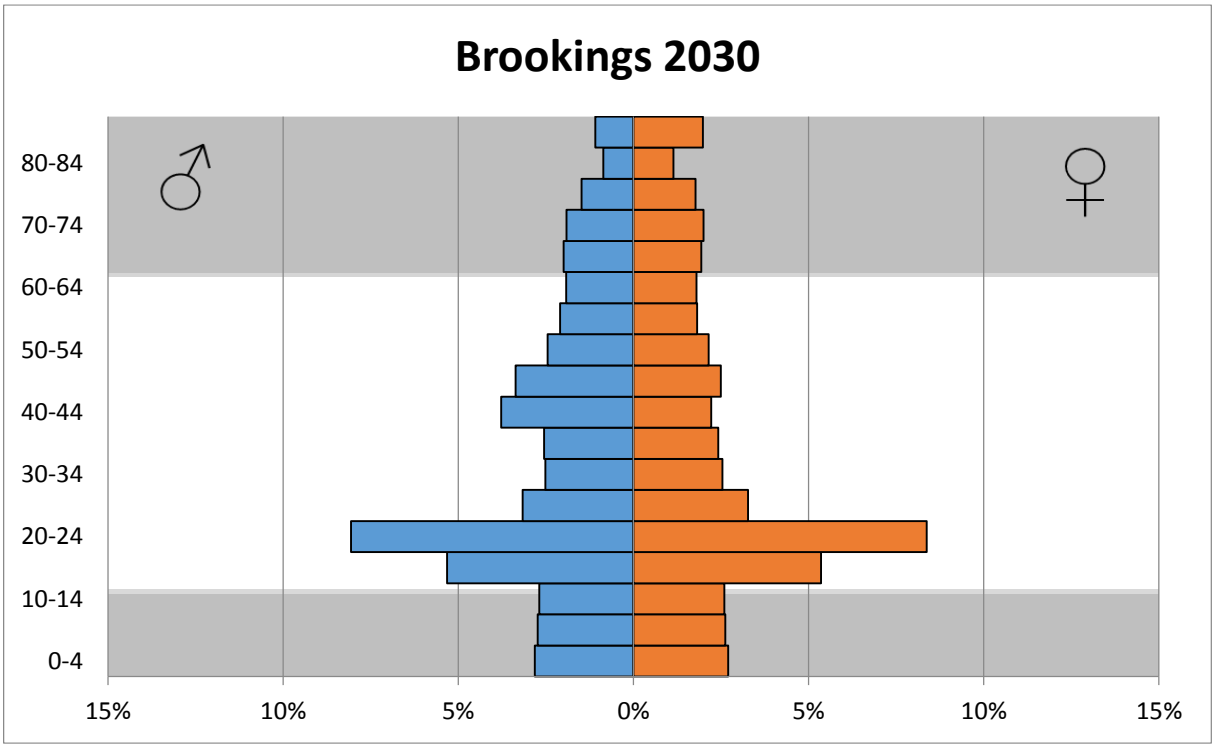
Brookings County Population Structure, 2020-2035

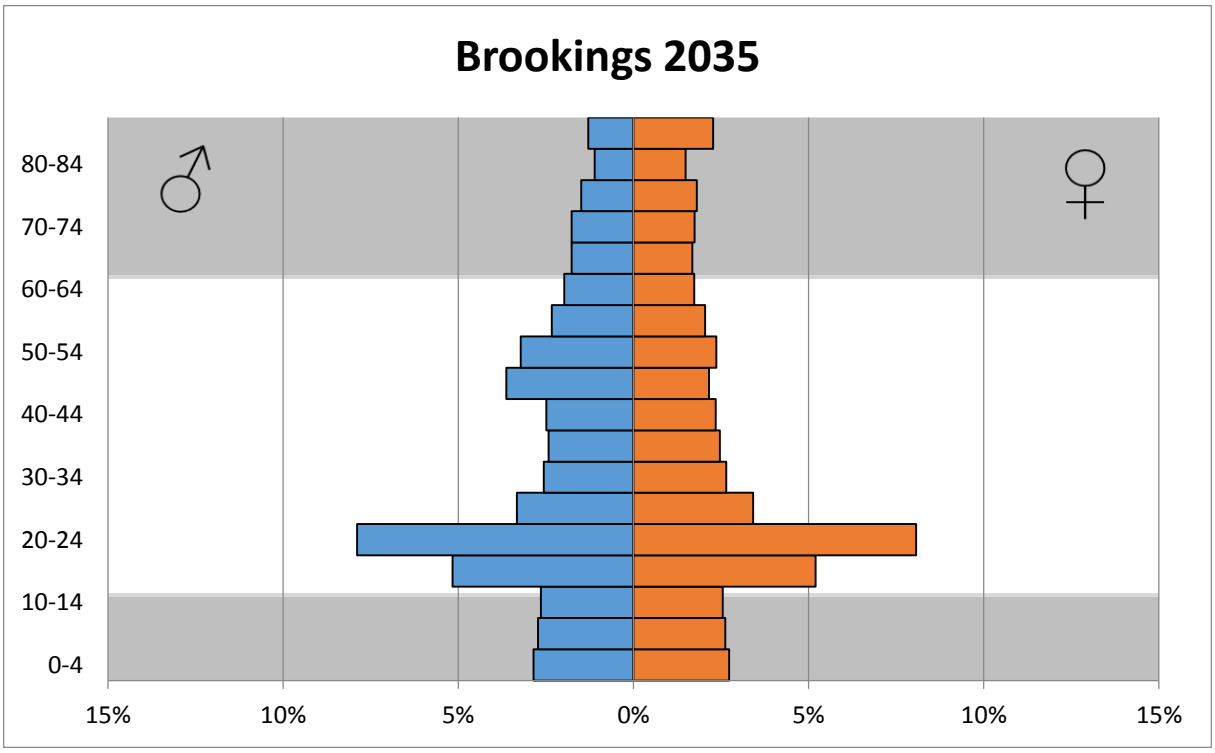
Maps of current population distributional patterns in the community illustrate where, within the area, residents and housing concentrated. To help implement a development plan, it is as well important to know the structure of the population residing in the community in the future. Under the contract with the Governor's Office in 2013, the Center constructed population projections to 2035 for counties in South Dakota based on the 2010 decennial Census population figures. Tables that include projected population counts by gender for Brookings County are presented in Appendix 1. In addition, the Center created a series of population pyramids to show the age (5-year interval) and gender structure of the future population in Brookings County. Population pyramids for the projections of 2020, 2025, 2030 and 2035 are shown in Figure 8. Although the Brookings County population is continuously growing (Appendix 1), the structure is stable: each subgroup (by age and gender) constitutes a relatively constant share of the total county population; the group aged 15-24 is the largest share of the total county population.

Figure 8 Brookings County Population Pyramids, 2020-2035




Brookings 2025
80-84
70-74
60-64
50-54
40-44
30-34
20-24
10-14
0-4
15%
10%
5%
0%
5%
10%
15%


Brookings 2030
80-84
70-74
60-64
50-54
40-44
30-34
20-24
10-14
0-4
15%
10%
5%
0%
5%
10%
15%


Brookings 2035
80-84
70-74
60-64
50-54
40-44
30-34
20-24
10-14
0-4
15%
10%
5%
0%
5%
10%
15%

APPENDIX 1 BROOKINGS COUNTY POPULATION PROJECTIONS TO 2035 FOR THE TOTAL, MALE, AND FEMALE

Total Population Projections -- Medium Series -- Brookings County						
Age	2010	2015	2020	2025	2030	2035
0-4	1907	1971	2017	2067	2151	2266
5-9	1697	1927	1993	2038	2087	2171
10-14	1562	1716	1947	2014	2059	2108
15-19	3643	3712	3864	4094	4162	4206
20-24	6358	5972	6031	6179	6407	6473
25-29	2647	2696	2309	2361	2509	2737
30-34	1774	2254	2307	1921	1968	2115
35-39	1526	1787	2267	2324	1941	1982
40-44	1469	1540	1800	2279	2340	1959
45-49	1622	1482	1549	1807	2286	2350
50-54	1736	1617	1477	1540	1793	2266
55-59	1650	1723	1606	1466	1525	1774
60-64	1204	1628	1705	1590	1451	1506
65-69	917	1159	1566	1643	1533	1399
70-74	698	852	1076	1451	1526	1425
75-79	543	613	745	939	1267	1336
80-84	465	455	512	620	781	1053
85+	547	741	877	1019	1200	1448
Total	31965	33846	35647	37353	38985	40571

Male Population Projections -- Medium Series -- Brookings County						
Age	2010	2015	2020	2025	2030	2035
0-4	949	1005	1029	1054	1097	1155
5-9	840	959	1015	1039	1064	1107
10-14	783	848	967	1025	1048	1073
15-19	1818	1833	1897	2016	2073	2097
20-24	3435	2956	2962	3024	3141	3198
25-29	1499	1649	1172	1171	1232	1349
30-34	949	1306	1460	985	978	1039
35-39	817	953	1308	1464	995	981
40-44	763	824	959	1314	1473	1007
45-49	832	767	826	960	1312	1473
50-54	865	833	767	824	956	1305
55-59	826	857	825	760	815	944
60-64	607	811	844	813	749	800
65-69	456	580	775	807	778	717
70-74	332	420	534	712	744	717
75-79	231	269	340	432	576	603
80-84	202	181	210	264	336	447
85+	178	261	304	354	425	523
Total	16382	17312	18194	19019	19793	20537

Female Population Projections -- Medium Series -- Brookings County						
Age	2010	2015	2020	2025	2030	2035
0-4	958	966	988	1013	1054	1110
5-9	857	969	977	999	1023	1064
10-14	779	868	980	989	1011	1035
15-19	1825	1879	1967	2079	2089	2109
20-24	2923	3015	3068	3155	3266	3275
25-29	1148	1047	1137	1190	1276	1388
30-34	825	948	848	936	990	1076
35-39	709	835	959	860	946	1001
40-44	706	716	840	965	867	952
45-49	790	716	724	848	973	877
50-54	871	784	709	716	837	961
55-59	824	866	781	706	711	829
60-64	597	817	861	777	702	706
65-69	461	579	791	835	755	682
70-74	366	432	541	739	782	708
75-79	312	344	405	507	691	733
80-84	263	275	302	356	445	606
85+	369	480	573	665	774	925
Total	15583	16534	17452	18334	19192	20034