2019 Colorado School District Cost of Living Analysis

Colorado Legislative Council

CONTENTS

2019 COLORADO SCHOOL DISTRICT COST OF LIVING ANALYSIS

CONDUCTED FOR THE COLORADO LEGISLATIVE COUNCIL

SECTION 1: OVERVIEW OF THE STUDY

Corona Insights is pleased to present the 2019 Colorado School District Cost of Living Analysis to the Colorado Legislative Council. The purpose of this study is to create a cost of living index for each of the 178 school districts in Colorado to be utilized in the per pupil funding formula for K-12 education, as mandated by the Public School Finance Act of 1994.

A cost of living index is a tool for comparing how expensive it is to live in one school district rather than another. We start by assuming that the same family buys the same things while living in different districts, and then figure out how much it costs to buy those things if the family is living in district A, how much it costs to buy those things if they are living in district B, and so on.

For the 2019 Colorado School District Cost of Living Study, our family (i.e., "benchmark household") is a family of three people with a total household income of $56,547, which is the average salary of a Colorado teacher with a bachelor's degree and 10 or more years of experience.

The research process involves the following steps, which are described in greater detail in Section 3:

1. We assume that the benchmark household spends their money on the same goods and services that a typical family of that size and income buys according to the national Consumer Expenditure Survey (CES) conducted by the Bureau of Labor Statistics (BLS).

2. We select a variety of specific items to represent categories of spending. For example, we select a banana to represent purchases of fruits and vegetables. These items comprise our market basket.

3. Then we collect prices for the items in the market basket from businesses or service providers (such as a utility) in each district.

4. We ask residents in each school district where they go to shop for retail items in the market basket, which may be in their own district or in different districts.

5. Based on where people typically shop, and how much items cost in each place, we figure out how much residents of each district typically pay for the total market basket. This allows us to compare how expensive it would be for the benchmark family to live in each district.

Section 2 of this report provides the results of this study, with maps and tables showing the relative cost of living in each school district in Colorado. Section 3 of this report provides in-depth information on the methodology and methods for the study. Appendices A-F provide additional results, raw data, research instruments and products, additional documentation on changes from the previous study, and statistical procedures used.

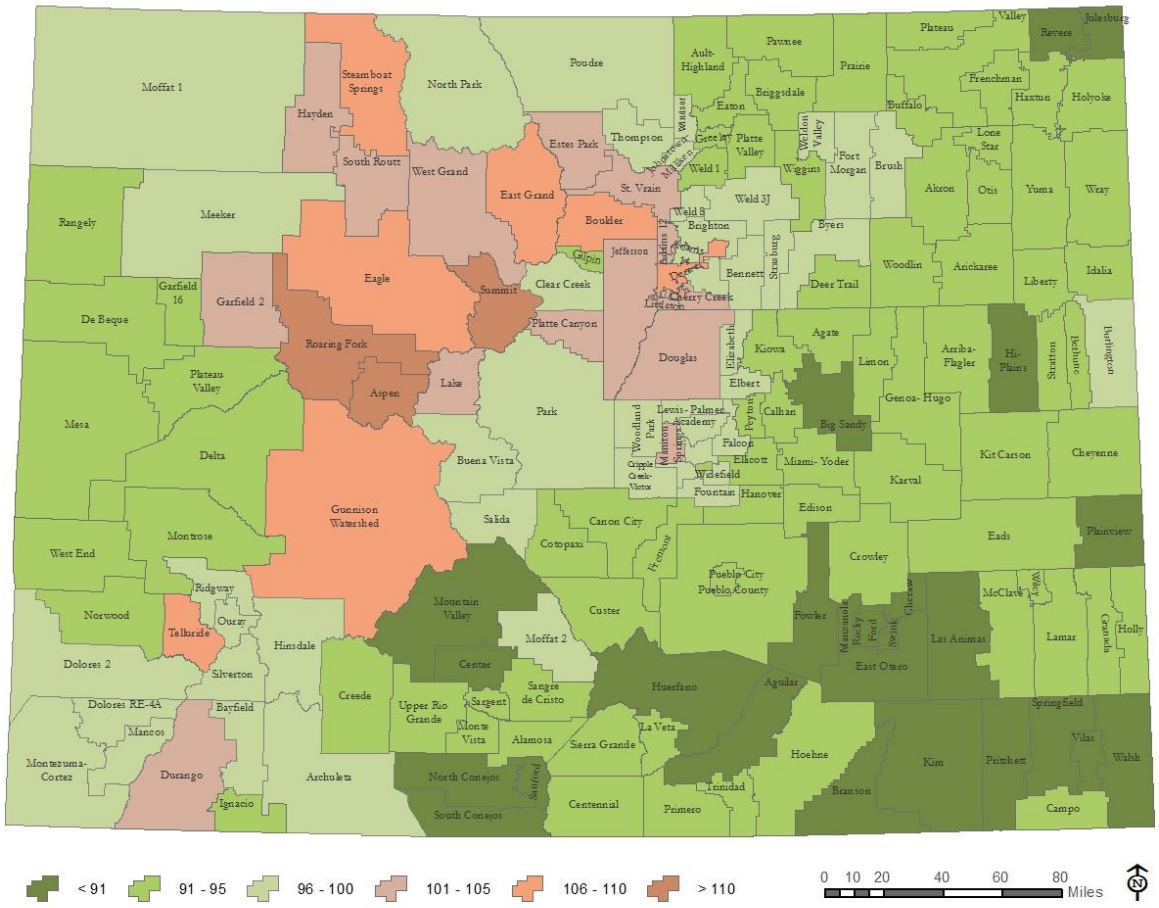
SECTION 2: 2019 COLORADO SCHOOL DISTRICT COST OF LIVING RESULTS

The table that extends across the following several pages provides the overall cost of living in each of Colorado's 178 school districts, as calculated in 2019. Figures are reported in order by District number (and alphabetically by County name), along with associated rankings, ratings, and comparisons.

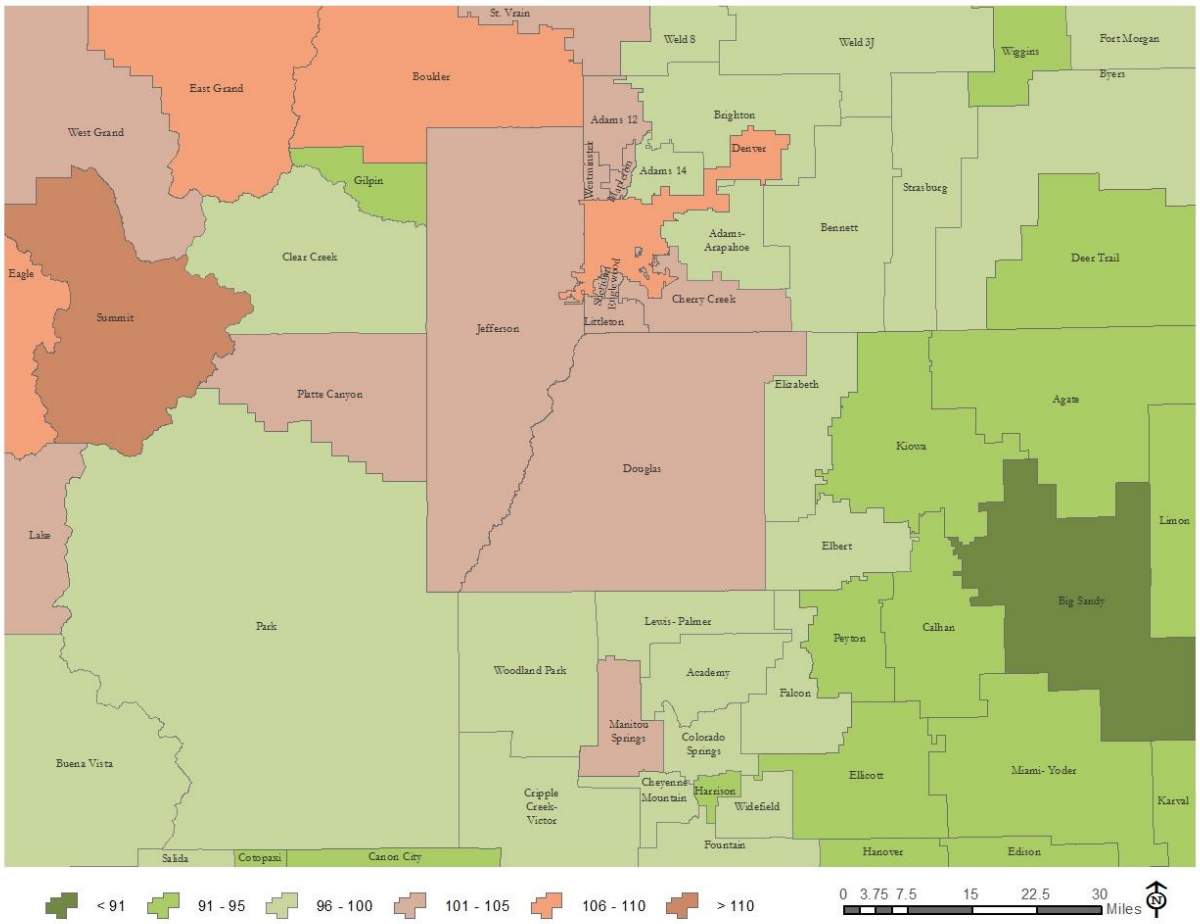
Cost of living figures relate to the cost of buying a market basket of goods and services that represents the spending patterns in the United States of the average 3-person household earning $56,547. (See Section 3.1 for more discussion of the archetypal household.) More detailed results by expense category may be seen in Appendix A. Raw data for selected goods may be seen in Appendix D.

The findings are largely consistent with previous years. Aspen continues to have the highest cost of living, however its disparity is less extreme in 2019 than it was in 2017, largely because of the addition of housing rent to the market basket, which is discussed in Appendix B. Other mountain resort districts make up the top of the list, including Summit County, Roaring Fork, Steamboat Springs, and Telluride districts. Boulder remains near the top at #6, with Denver at #8. The districts with the lowest costs of living are primarily located in the southeastern corner of the state.

Below, two maps provide a visual summary of the cost of living index for the 178 school districts. The first map is a statewide view and the second is a detailed view of the Denver and Colorado Springs metro areas. Statewide maps for each major expenditure category are provided in Appendix A.



Note. The index value is the ratio of the cost of the market basket in each district to the statewide average cost of the market basket. An index value that is greater than 100 means that district is more expensive than average, while a value less than 100 means that district is less expensive than average. In this map, shades of green depict less expensive districts, while shades of orange depict more expensive districts.



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2019 Cost of Living Index for Colorado School Districts					
School District ID	County	School District	Total	Index	Rank 2019
		State Average	$56,547	100	
10	Adams	MAPLETON 1	$56,774	100	26
20	Adams	ADAMS 12 FIVE STAR SCHOOLS	$56,884	101	24
30	Adams	ADAMS COUNTY 14	$55,792	99	40
40	Adams	SCHOOL DISTRICT 27J	$56,146	99	32
50	Adams	BENNETT 29J	$55,562	98	42
60	Adams	STRASBURG 31J	$55,901	99	36
70	Adams	WESTMINSTER PUBLIC SCHOOLS	$57,570	102	16
100	Alamosa	ALAMOSA RE-11J	$51,853	92	120
110	Alamosa	SANGRE DE CRISTO RE-22J	$52,551	93	105
120	Arapahoe	ENGLEWOOD 1	$59,184	105	11
123	Arapahoe	SHERIDAN 2	$57,099	101	23
130	Arapahoe	CHERRY CREEK 5	$56,689	100	29
140	Arapahoe	LITTLETON 6	$58,640	104	13
170	Arapahoe	DEER TRAIL 26J	$52,865	93	99
180	Arapahoe	ADAMS-ARAPAHOE 28J	$56,006	99	34
190	Arapahoe	BYERS 32J	$53,925	95	72
220	Archuleta	ARCHULETA COUNTY 50 JT	$54,392	96	60
230	Baca	WALSH RE-1	$50,699	90	157
240	Baca	PRITCHETT RE-3	$49,902	88	169
250	Baca	SPRINGFIELD RE-4	$50,460	89	162
260	Baca	VILAS RE-5	$50,519	89	160
270	Baca	CAMPO RE-6	$50,974	90	151
290	Bent	LAS ANIMAS RE-1	$49,152	87	177
310	Bent	MC CLAVE RE-2	$51,156	90	146
470	Boulder	ST VRAIN VALLEY RE 1J	$56,719	100	27
480	Boulder	BOULDER VALLEY RE 2	$60,607	107	6
490	Chaffee	BUENA VISTA R-31	$56,536	100	30
500	Chaffee	SALIDA R-32	$55,669	98	41
510	Cheyenne	KIT CARSON R-1	$51,321	91	139
520	Cheyenne	CHEYENNE COUNTY RE-5	$51,422	91	134
540	Clear Creek	CLEAR CREEK RE-1	$54,979	97	53
550	Conejos	NORTH CONEJOS RE-1J	$50,617	90	159
560	Conejos	SANFORD 6J	$49,577	88	172
580	Conejos	SOUTH CONEJOS RE-10	$50,463	89	161
640	Costilla	CENTENNIAL R-1	$51,002	90	150
740	Costilla	SIERRA GRANDE R-30	$51,216	91	142
770	Crowley	CROWLEY COUNTY RE-1-J	$51,038	90	149
860	Custer	CUSTER COUNTY SCHOOL DISTRICT C-1	$53,654	95	78
870	Delta	DELTA COUNTY 50(J)	$51,797	92	123

2019 Cost of Living Index for Colorado School Districts					
School District ID	County	School District	Total	Index	Rank 2019
		State Average	$56,547	100	
880	Denver	DENVER COUNTY 1	$60,348	107	8
890	Dolores	DOLORES COUNTY RE NO.2	$54,176	96	66
900	Douglas	DOUGLAS COUNTY RE 1	$57,377	101	19
910	Eagle	EAGLE COUNTY RE 50	$60,522	107	7
920	Elbert	ELIZABETH SCHOOL DISTRICT	$54,306	96	62
930	Elbert	KIOWA C-2	$53,693	95	75
940	Elbert	BIG SANDY 100J	$50,637	90	158
950	Elbert	ELBERT 200	$54,626	97	58
960	Elbert	AGATE 300	$52,565	93	104
970	El Paso	CALHAN RJ-1	$52,093	92	112
980	El Paso	HARRISON 2	$53,682	95	77
990	El Paso	WIDEFIELD 3	$55,119	97	49
1000	El Paso	FOUNTAIN 8	$54,070	96	67
1010	El Paso	COLORADO SPRINGS 11	$54,354	96	61
1020	El Paso	CHEYENNE MOUNTAIN 12	$55,100	97	51
1030	El Paso	MANITOU SPRINGS 14	$57,726	102	15
1040	El Paso	ACADEMY 20	$55,421	98	45
1050	El Paso	ELLICOTT 22	$53,107	94	91
1060	El Paso	PEYTON 23 JT	$52,525	93	106
1070	El Paso	HANOVER 28	$53,490	95	86
1080	El Paso	LEWIS-PALMER 38	$56,238	99	31
1110	El Paso	DISTRICT 49	$54,691	97	57
1120	El Paso	EDISON 54 JT	$51,983	92	114
1130	El Paso	MIAMI/YODER 60 JT	$51,933	92	118
1140	Fremont	CANON CITY RE-1	$53,027	94	92
1150	Fremont	FREMONT RE-2	$52,910	94	95
1160	Fremont	COTOPAXI RE-3	$52,874	94	96
1180	Garfield	ROARING FORK RE-1	$64,234	114	3
1195	Garfield	GARFIELD RE-2	$56,715	100	28
1220	Garfield	GARFIELD 16	$52,873	94	98
1330	Gilpin	GILPIN COUNTY RE-1	$53,249	94	90
1340	Grand	WEST GRAND 1-JT	$57,126	101	22
1350	Grand	EAST GRAND 2	$59,545	105	9
1360	Gunnison	GUNNISON WATERSHED RE1J	$59,469	105	10
1380	Hinsdale	HINSDALE COUNTY RE 1	$55,945	99	35
1390	Huerfano	HUERFANO RE-1	$50,117	89	167
1400	Huerfano	LA VETA RE-2	$51,167	90	145
1410	Jackson	NORTH PARK R-1	$55,530	98	44

2019 Cost of Living Index for Colorado School Districts					
School District ID	County	School District	Total	Index	Rank 2019
		State Average	$56,547	100	
1420	Jefferson	JEFFERSON COUNTY R-1	$57,178	101	21
1430	Kiowa	EADS RE-1	$51,111	90	148
1440	Kiowa	PLAINVIEW RE-2	$50,333	89	165
1450	Kit Carson	ARRIBA-FLAGLER C-20	$51,637	91	129
1460	Kit Carson	HI-PLAINS R-23	$50,384	89	163
1480	Kit Carson	STRATTON R-4	$52,038	92	113
1490	Kit Carson	BETHUNE R-5	$52,163	92	109
1500	Kit Carson	BURLINGTON RE-6J	$53,990	95	71
1510	Lake	LAKE COUNTY R-1	$57,436	102	18
1520	La Plata	DURANGO 9-R	$56,867	101	25
1530	La Plata	BAYFIELD 10 JT-R	$54,803	97	56
1540	La Plata	IGNACIO 11 JT	$53,625	95	81
1550	Larimer	POUDRE R-1	$55,137	98	48
1560	Larimer	THOMPSON R2-J	$56,049	99	33
1570	Larimer	ESTES PARK R-3	$59,152	105	12
1580	Las Animas	TRINIDAD 1	$51,170	90	144
1590	Las Animas	PRIMERO REORGANIZED 2	$50,937	90	153
1600	Las Animas	HOEHNE REORGANIZED 3	$51,416	91	136
1620	Las Animas	AGUILAR REORGANIZED 6	$50,741	90	155
1750	Las Animas	BRANSON REORGANIZED 82	$50,002	88	168
1760	Las Animas	KIM REORGANIZED 88	$49,577	88	171
1780	Lincoln	GENOA-HUGO C113	$51,625	91	131
1790	Lincoln	LIMON RE-4J	$53,649	95	79
1810	Lincoln	KARVAL RE-23	$51,390	91	137
1828	Logan	VALLEY RE-1	$53,249	94	89
1850	Logan	FRENCHMAN RE-3	$51,951	92	116
1860	Logan	BUFFALO RE-4J	$52,859	93	100
1870	Logan	PLATEAU RE-5	$51,640	91	128
1980	Mesa	DE BEQUE 49JT	$52,611	93	103
1990	Mesa	PLATEAU VALLEY 50	$52,787	93	101
2000	Mesa	MESA COUNTY VALLEY 51	$53,690	95	76
2010	Mineral	CREEDE SCHOOL DISTRICT	$52,941	94	94
2020	Moffat	MOFFAT COUNTY RE:NO 1	$54,817	97	55
2035	Montezuma	MONTEZUMA-CORTEZ RE-1	$54,484	96	59
2055	Montezuma	DOLORES RE-4A	$55,110	97	50
2070	Montezuma	MANCOS RE-6	$55,554	98	43

2019 Cost of Living Index for Colorado School Districts					
School District ID	County	School District	Total	Index	Rank 2019
		State Average	$56,547	100	
2180	Montrose	MONTROSE COUNTY RE-1J	$53,596	95	83
2190	Montrose	WEST END RE-2	$52,432	93	107
2395	Morgan	BRUSH RE-2(J)	$54,301	96	63
2405	Morgan	FORT MORGAN RE-3	$53,737	95	73
2505	Morgan	WELDON VALLEY RE-20(J)	$53,733	95	74
2515	Morgan	WIGGINS RE-50(J)	$53,593	95	84
2520	Otero	EAST OTERO R-1	$49,317	87	173
2530	Otero	ROCKY FORD R-2	$49,198	87	176
2535	Otero	MANZANOLA 3J	$49,231	87	175
2540	Otero	FOWLER R-4J	$50,285	89	166
2560	Otero	CHERAW 31	$49,281	87	174
2570	Otero	SWINK 33	$49,024	87	178
2580	Ouray	OURAY R-1	$54,978	97	54
2590	Ouray	RIDGWAY R-2	$55,796	99	39
2600	Park	PLATTE CANYON 1	$57,227	101	20
2610	Park	PARK COUNTY RE-2	$55,274	98	47
2620	Phillips	HOLYOKE RE-1J	$53,633	95	80
2630	Phillips	HAXTUN RE-2J	$51,874	92	119
2640	Pitkin	ASPEN 1	$73,707	130	1
2650	Prowers	GRANADA RE-1	$51,318	91	140
2660	Prowers	LAMAR RE-2	$51,468	91	133
2670	Prowers	HOLLY RE-3	$51,705	91	126
2680	Prowers	WILEY RE-13 JT	$51,371	91	138
2690	Pueblo	PUEBLO CITY 60	$51,811	92	122
2700	Pueblo	PUEBLO COUNTY 70	$52,874	94	97
2710	Rio Blanco	MEEKER RE1	$54,019	96	70
2720	Rio Blanco	RANGELY RE-4	$51,848	92	121
2730	Rio Grande	UPPER RIO GRANDE SCHOOL DISTRICT C-7	$52,135	92	111
2740	Rio Grande	MONTE VISTA C-8	$51,171	90	143
2750	Rio Grande	SARGENT RE-33J	$51,138	90	147
2760	Routt	HAYDEN RE-1	$57,454	102	17
2770	Routt	STEAMBOAT SPRINGS RE-2	$62,048	110	4
2780	Routt	SOUTH ROUTT RE 3	$57,933	102	14
2790	Saguache	MOUNTAIN VALLEY RE 1	$50,732	90	156
2800	Saguache	MOFFAT 2	$54,048	96	68
2810	Saguache	CENTER 26 JT	$49,673	88	170

2019 Cost of Living Index for Colorado School Districts					
School District ID	County	School District	Total	Index	Rank 2019
		State Average	$56,547	100	
2820	San Juan	SILVERTON 1	$55,869	99	38
2830	San Miguel	TELLURIDE R-1	$61,962	110	5
2840	San Miguel	NORWOOD R-2J	$52,966	94	93
2862	Sedgwick	JULESBURG RE-1	$50,863	90	154
2865	Sedgwick	REVERE SCHOOL DISTRICT	$50,367	89	164
3000	Summit	SUMMIT RE-1	$64,583	114	2
3010	Teller	CRIPPLE CREEK-VICTOR RE-1	$54,199	96	65
3020	Teller	WOODLAND PARK RE-2	$55,894	99	37
3030	Washington	AKRON R-1	$51,769	92	125
3040	Washington	ARICKAREE R-2	$51,627	91	130
3050	Washington	OTIS R-3	$52,153	92	110
3060	Washington	LONE STAR 101	$51,970	92	115
3070	Washington	WOODLIN R-104	$51,935	92	117
3080	Weld	WELD COUNTY RE-1	$52,655	93	102
3085	Weld	EATON RE-2	$53,284	94	88
3090	Weld	WELD COUNTY SCHOOL DISTRICT RE-3J	$54,286	96	64
3100	Weld	WINDSOR RE-4	$55,380	98	46
3110	Weld	JOHNSTOWN-MILLIKEN RE-5J	$55,005	97	52
3120	Weld	GREELEY 6	$53,602	95	82
3130	Weld	PLATTE VALLEY RE-7	$51,641	91	127
3140	Weld	WELD RE-8 SCHOOLS	$54,042	96	69
3145	Weld	AULT-HIGHLAND RE-9	$52,358	93	108
3146	Weld	BRIGGSDALE RE-10	$51,417	91	135
3147	Weld	PRAIRIE RE-11	$51,288	91	141
3148	Weld	PAWNEE RE-12	$50,963	90	152
3200	Yuma	YUMA 1	$51,797	92	124
3210	Yuma	WRAY RD-2	$53,521	95	85
3220	Yuma	IDALIA RJ-3	$53,337	94	87
3230	Yuma	LIBERTY J-4	$51,550	91	132

SECTION 3: METHODOLOGY

3.1 IDENTIFYING THE BENCHMARK HOUSEHOLD

The first step in a cost of living study is to determine whose cost of living the index will reflect. This entity is referred to as the "benchmark household". The 2019 benchmark household was defined by the Colorado Legislative Council to be a three-person household with a total annual household income of $56,547, which is the average salary in 2018 of a Colorado teacher with a bachelor's degree and 10 or more years of experience. A three-person household is the average household size in Colorado (US Census Bureau, 2014-2018). This benchmark household was defined in the same way as in prior studies in 2015 and 2017. (Prior to 2015, the benchmark household was defined using the average teacher salary, overall, without specifying a level of education and experience.)

Over the past studies, the household size has remained constant, and the household income has increased at a moderate rate. The table below summarizes the history of benchmark household income values used for the study.

Household Income Definition for 3-Person Benchmark Household		
Year	Household Income	Percent Change
2019	$56,547	6.5%
2017	$53,115	2.3%
2015[a]	$51,930	5.3%
2013[b]	$49,300	0.2%
2011	$49,200	3.6%
2009	$47,500	6.7%
2007	$44,500	3.5%
2005	$43,000	7.5%
2003	$40,000	5.3%
2001	$38,000	

[a] Since 2015, the household income definition has specified the average salary of a Colorado teacher with a bachelor's degree and 10 or more years of experience. [b] The 2013 salary was revised to be consistent with the 2015 household income definition. The 2013 study originally used a salary of $49,100.

3.2 IDENTIFYING THE MARKET BASKET OF GOODS AND SERVICES

The next step in a cost of living study is to determine what the benchmark household will buy. The goal of this step is to develop a list of goods and services that, in combination, can represent the full range of typical annual purchases for the benchmark household. To begin, we obtain a list of spending categories from the

Consumer Expenditure Survey (CES), which is conducted by the Bureau of Labor Statistics (BLS). The CES gathers information on the buying habits of American consumer households and then provides summary data about what households spend their money on and how much of their spending goes to each category. In particular, they provide data on the spending habits of 3-person households at different income levels that we use to calculate typical expenditures for our benchmark family earning $56,547. The table below shows the major expenditure categories and the amount of income spent on each category, sorted from largest to smallest expenditures.

Consumer Expenditures for a 3-Person Household Earning $56,547

Expenditure Category	% of Income 2019	% of Income 2017
Housing	32.3%	32.8%
Transportation	16.9%	17.8%
Food	13.5%	13.1%
Healthcare	8.9%	8.3%
Personal taxes	5.2%	4.9%
Entertainment	4.1%	3.8%
Apparel and services	2.7%	3.0%
Personal care products and services	1.2%	1.1%
Tobacco	0.9%	1.0%
Alcoholic beverages	0.5%	0.6%
Other	13.8%	14.2%
Total	*100%*	*100%*

Starting from the detailed expenditure categories (provided in the table below), Corona Insights and the Colorado Legislative Council developed a list of specific goods and services to represent the expenditures of our benchmark household. This list of goods and services comprise the "market basket" for the cost of living study. An effort was made to retain market basket items from the previous study, while selecting items to meet the criteria of a) representativeness of the expenditure category, b) widely available statewide in a substantially similar form, c) represent a minimum proportion of spending (e.g., at least 0.5%), and d) have prices that vary more between districts than within districts. More information on the selection criteria for 2019 can be found in Appendix B.

Consumer Expenditure Survey Categories and Specific Weights Utilized in Cost of Living Index		
Expenditure Category	% of Income	Representative Market Basket Items 2019
Food	**13.55%**	
Food at home	8.03%	
Cereals and bakery products	1.11%	Cheerios
Meats, poultry, fish, and eggs	1.75%	Ground Beef
Dairy products	0.79%	Milk
Fruits and vegetables	1.54%	Bananas
Other food at home	2.84%	Coke
Food away from home	5.52%	Pizza
Housing	**32.31%**	
Owned Dwellings	10.11%	
Mortgage interest and charges	5.14%	Mortgage Payment
Property taxes	2.80%	Property Taxes
Maintenance, repairs, insurance, other expenses	2.17%	Homeowner's Insurance
Rented Dwellings	7.76%	Rent Payment
Utilities, fuels, and public services	7.69%	
Natural gas	0.69%	Natural Gas
Electricity	3.05%	Electric
Telephone services	2.81%	Telephone
Water and other public services	1.14%	Water & Sewer
Household operations	2.45%	Day Care Services
Household furnishings and equipment & Housekeeping supplies	4.30%	Smoke Detector
Transportation	**16.94%**	
Vehicle purchases (net outlay) & vehicle finance charges	8.05%	Car Payment (Interest rate, bank financing fees, taxes, title, registration)
Gasoline and motor oil	4.11%	Gasoline: 85 Unleaded
Other vehicle expenses	4.78%	
Maintenance and repairs	2.02%	Oil and Filter Change, Front-End Alignment
Vehicle insurance	2.77%	Insurance Premiums
Healthcare	**8.92%**	Health Insurance Premium
Entertainment	**4.09%**	Movie Ticket (First Run, Full Length Film)
Personal care products and services	**1.16%**	Woman's Haircut, Man's Haircut
Personal taxes (not including stimulus)	**5.16%**	Income Tax with Itemized Deductions for Mortgage Interest
Other *[assumed not to vary between districts]*	**17.87%**	
Alcoholic beverages	0.53%	
Apparel and services	2.70%	
Reading	0.14%	
Education	1.14%	
Tobacco products and smoking supplies	0.88%	
Miscellaneous	1.84%	
Cash contributions	2.16%	
Personal insurance and pensions	8.50%	
Total	*100.00%*	

3.3 DETERMINING WHERE, WHEN, AND HOW TO COLLECT COSTS OF MARKET BASKET ITEMS

Market basket items can be divided into two main categories for data collection. In the first category are retail goods and services that can be purchased from many shopping locations throughout the state. These items include groceries, restaurant meals, household items, auto services, gasoline, haircuts, and movies. In the second category are items most people think of as bills: mortgage and rent payments, car payment, insurance, utilities, and taxes. In 2019, prices for most of the retail goods and services were obtained by making telephone calls to individual businesses as well as visits to select websites of retailers. In contrast, prices for most of the bills were calculated from information provided in government publications, other publicly available data, and through municipal authorities (either via telephone calls or online, where published).

RETAIL ITEMS

The table below provides the data source and data collection method for each of the retail items.

	CES Category	Market Basket Item	Data Source	Collection Method
Food	Cereals and bakery products	Cheerios	Sample from D&B Hoovers business listings for Grocery/General Stores/Convenience Stores	Phone calls to businesses
	Fruits and vegetables	Bananas		
	Meats, poultry, fish and eggs	Ground beef		
	Dairy	Milk		
	Other food at home	Coke		
	Food away from home	Pizza	Sample from D&B Hoovers business listings for Pizza Restaurants	
Housing	Housekeeping supplies, furnishings, & equipment	Smoke detector	Sample from D&B Hoovers business listings for Hardware/Department Stores/Grocery/General Stores/Drugstores	
	Entertainment	Movie ticket	Sample from D&B Hoovers business listings for Movie Theaters	
	Personal care	Man's haircut	Sample from D&B Hoovers business listings for Beauty & Barber Shops	
	Personal care	Woman's haircut		
Transportation	Maintenance and repairs	Oil and filter change	Sample from D&B Hoovers business listings for Auto Repair	
	Maintenance and repairs	Front-end alignment		
	Gasoline and motor oil	Gasoline: 85 unleaded	Oil Price Information Service	Purchase database

For each of the retail items, we identified a set of Standard Industrial Classification (SIC) codes that corresponded to businesses that were likely to sell the item. We then purchased a list of all businesses associated with those SIC codes from D&B Hoovers. To select a sample of businesses to collect prices from, we first used ArcGIS software to map the latitude and longitude coordinates for each business to the school district for each business using school district shape files available from the Census Bureau. As in the previous study, we determined that a sample of 10 businesses per item per school district was the minimum target. Because not all businesses would answer their phones or provide pricing information, we determined to start with a sample of 15 businesses per item per district in order to obtain 10 prices. In many districts, there were fewer than 15 businesses available for some items. In those cases, all known businesses in those districts were included in the sample. In districts with more than 15 businesses available, a weighted random sample of businesses was selected where weights were used to ensure that the sample of businesses reflects the market share of businesses in the community.

From a statistical perspective, if all stores selling a given product had an equal market share, meaning people were just as likely to buy the product at any store as any other store, then taking a simple random sample of stores would be appropriate, and calculating simple averages of the prices available at those stores would give a reasonably accurate measure of what people pay and how confident we are in that estimate as a function of the sample size within the universe of stores. However, because people tend to shop more at some stores than others (or more people shop at some stores than others), the average amount paid isn't a simple average of the prices available across stores, but is a weighted average of prices available by how many people buy at each location (i.e., the market share of the location). Rather than weighting the prices obtained on the back end, we instead sampled businesses according to market share in order to account for this complexity. However, this methodology was most flawed in small districts where we were likely to gather prices from all businesses selling a product and weight them equally in calculating a district price, even though there may be one particular business in that district that is responsible for a disproportionate percentage of sales of that item in that district.

To gather data from the sample of businesses selected, we primarily made phone calls to the individual businesses, however we also gathered some pricing online, where pricing for individual business locations was available. In addition, online sources were used to verify business addresses, search for missing or alternate phone numbers, verify business closures, and search for additional businesses in districts where no businesses existed in the sample. Online sources were also used if businesses in the district did not provide pricing.

To execute the phone survey, Corona recruited temporary contractors to perform the data collection. A Corona principal who has been involved in past data collection for this project served as the phone research manager and was in charge of training and overseeing the staff. All hires were screened, interviewed, and background checked prior to employment by our staffing agency. Data collectors were paid hourly. Phone calls and online searches were made from Corona's office.

Corona developed an overview and training guide for data collectors. Corona then conducted training with all data collectors. Training time focused on the importance of collecting data in the exact same manner from all businesses contacted and included how to record prices and how to enter data. Data collectors focused on one product at a time and prior to starting data collection for a specific item, a thorough review of that market basket item, including relevant details, common questions and allowed substitutions, was provided. The research manager and other Corona staff were available for questions during the entire data collection period. The research manager also made periodic check-ins with the data collectors to answer questions and monitor progress. Data was entered directly into an Excel spreadsheet.

Most of the phone data collection was completed in a two-week period to minimize variability in pricing due to timing. The research manager conducted random data checks to ensure the correct prices were collected.

Gasoline prices were the only retail item collected in a different manner. The Oil Price Information Service gathers and compiles daily data on gas prices from individual locations across Colorado and makes this information available for purchase.

NON-RETAIL ITEMS ("BILLS")

The table below provides the data source and data collection method for each of the non-retail items.

	CES Category	Specific Item	Data Source	Collection Method
Housing	Shelter	Mortgage Payment	Housing values from outside consultant; interest rate from Zillow	Secondary Data & Online Sources
	Shelter	Property Taxes	Colorado Dept of Local Affairs 2018 Annual Report and April 2019 Final Residential Rate Study	Available online
	Shelter	Homeowners' Insurance	Colorado Dept of Regulatory Agencies, Division of Insurance	Available online
	Shelter	Rent Payment	2013 - 2017 American Community Survey (ACS) 5-year dataset	Available online
	Utilities	Electric	Colorado Association of Municipal Utilities, U.S. Dept of Homeland Secruity, National Oceanic and Atmospheric Administration, Colorado Public Utilities Commission	Online sources Phone calls to providers
	Utilities	Natural gas	Colorado Public Utilities Commission, National Oceanic and Atmospheric Administration, U.S. Energy Information Administration	Online sources Phone calls to providers
	Utilities	Telephone	Colorado Dept of Revenue, Colorado Dept of Regulatory Agencies,The Tax Foundation	Available online
	Utilities	Water and Wastewater	Water and wastewater utilities throughout the state. Homeguide.com and Homeadvisor.com.	Online sources Phone calls to providers
	Household Operations	Day Care Services	The Self-Sufficiency Standard for Colorado 2018; US Office of Child Care	Available online
Transportation	Vehicle purchases & vehicle finance charges	Vehicle Payment	D&B Hoovers business list for banks and credit unions; Kelley Blue Book; Colorado Dept of Revenue; Colorado Legislative Council	Available online (vehicle specs, taxes, registration) Phone calls (loan rates, bank fees)
	Vehicle insurance	Auto Insurance Premium	Colorado Dept of Regulatory Agencies, Division of Insurance (Plan 2, Driver C)	Available online
	Healthcare	Health Insurance Premium	Colorado Dept of Regulatory Agencies, Division of Insurance	Available online

Data collection for non-retail items was tailored to each item, but in most cases involved locating some publicly available information and supplementing with phone calls to specific providers or municipal authorities to fill in missing information. Corona staff executed the data collection for these items, with the exception of bank rates and fees for the vehicle payment calculation, which were collected by phone calls to banks and credit

unions by the temporary staff, as described in the previous section on phone calls for retail items. More information about the data collection for each of these items is provided in the next section of the report.

3.4 DATA COLLECTION DETAILS

PROCESS OVERVIEW

For the retail items identified above, the data collection process followed the same steps, so we describe those as a group, below. For each of the non-retail items, we describe their data collection process individually.

RETAIL ITEMS

Retail item prices were collected by telephone for every district. The sample for telephone calls was prepared following the protocol described in the previous section of the report. Detailed item descriptions for each of these items, as well as the number of prices obtained for each item is provided in the table below.

	CES Category	Market Basket Item	Description	Collection Method	N Obs 2019
Food	Cereals and bakery products	Cheerios	Price of General Mills Cheerios Toasted Whole Grain Oat Cereal plain, 8.9 oz. If size not available, note difference in size and record price.	Phone calls to businesses	441
	Fruits and vegetables	Bananas	Price per pound. If bananas are priced by the bag or by the banana, note that in the file. Do not price organic.		350
	Meats, poultry, fish and eggs	Ground beef	Price per pound of prepackaged, regular ground beef, 80% lean or most comparable, from a 1 to 2 pound package of loose ground beef. Note		344
	Dairy	Milk	Price for one gallon (128 Fl. oz.) 2% milk, collect cheapest price. If no 2%, then price (in order of preference) 1%, skim, whole. Note if not		561
	Other food at home	Coke	Price for a 2L bottle of regular Coca-Cola. Do not price diet, caffeine free, cherry, or other varieties.		537
	Food away from home	Pizza	Price for a cheese pizza, regular or thin crust, 14" diameter (note size if other).		367
Housing	Housekeeping supplies, furnishings, & equipment	Smoke detector	Price of most basic smoke detector offered. Preferably no dual carbon monoxide, dual sensor, 10 year, or similar. Note any premium features on model priced.		233
	Entertainment	Movie ticket	Price of adult admission to a first-run, full-length movie.		72
	Personal care	Man's haircut	Price of man's wash, cut, and dry.		476
	Personal care	Woman's haircut	Price of woman's wash, cut, and dry without styling.		451
Transportation	Maintenance and repairs	Oil and filter change	Price of an oil and filter change for a 2015 Ford F150 pickup with a 3.5 liter engine. Price includes new filter, 6 qts of 5w-30 synthetic oil, and disposal of old oil. Do not price with tax.		334
	Maintenance and repairs	Front-end alignment	Price of front-end alignment for a 2015 Ford F150 pickup with 2-wheel drive.		182
	Gasoline and motor oil	Gasoline: 85 unleaded	Price per gallon of self-serve, 85 Octane, unleaded gasoline.	Purchase database	1801

After all data was collected, Corona staff validated and cleaned the data. Data collectors included notes next to any price where the item diverged from the market basket description. We reviewed those notes and

adjusted any prices accordingly (typically scaling prices for differently sized items or multi-packs) and scanned for any obvious data entry errors. Next, outliers were identified and removed, using the same rule as the previous study. Specifically, we used box and whisker plots and truncated extreme values to the boxplot whisker (i.e., the 25th or 75th percentile plus 1.5 times the inter-quartile range).

Finally, appropriate taxes for each item in each location were added to each price, and an average price was calculated for each district. For food at home items, appropriate grocery taxes were applied; for food away from home items, appropriate dining out taxes were applied; and normal sales taxes were applied to the smoke detector as well as 40% of the oil change price (which reflects the portion of the cost covering materials as opposed to labor). No tax was applied to haircut prices or front-end alignment prices as they are not considered taxable goods. Movie ticket prices are taxed in some districts, and taxes were collected with the price where applicable.

NON-RETAIL ITEMS SUMMARY

Detailed item descriptions for each of the non-retail items, as well as the number of prices obtained for each item is provided in the table below.

CES Category		Specific Item	Description	Collection Method	N Obs 2019
Housing	Shelter	Mortgage Payment	Mortgage payment, including principal and interest, based on housing values provided by outside consultant	Secondary Data & Online Sources	1 per district
	Shelter	Property Taxes	Property taxes based on district home value, residential assessment rate, and mill levies	Available online	1 per district, 1 per county
	Shelter	Homeowners' Insurance	$200,000 frame dwelling, $160,000 contents coverage, $100,000 personal liability, $1,000 medical expense, $500 deductible	Available online	15 providers in 24 cities
	Shelter	Rent Payment	Median gross rent paid for a three-bedroom home	Available online	Estimates for 159 districts
	Utilities	Electric	Price for 700 kWh per month, adjusted for ue by climate, plus utility sales tax	Online sources Phone calls to providers	55 electric utilities
	Utilities	Natural gas	Price for 62.5 therm per month, adjusted for use by climate, plus utility sales tax	Online sources Phone calls to providers	68 service areas
	Utilities	Telephone	Taxes, surcharges, and fees associated with monthly mobile phone service	Available online	Not applicable
	Utilities	Water and Wastewater	Annual average bill for water service using 11,000 gallons per month and wastewater service using 5,000 gallons per month. Well and septic systems were priced based on item cost and installation, operation, and maintenance divided by the life expectancy of a system.	Online sources Phone calls to providers	276 utilities
	Household Operations	Day Care Services	Weekly cost of child day care	Available online	3 per county
Transportation	Vehicle purchases & vehicle finance charges	Vehicle Payment	Payment calculated using Blue Book purchase value and interest rate on loan for full purchase price and bank charges, taxes and registration fees for 2017 Honda Civic for four years. (2017 Honda Civic LX Sedan, 4-door. Engine: 4-cyl. 2.0L. Trans: Automatic/CVT. Mileage: 24,000. Amenities: air conditioning, pwr. steering, cruise control, air bags - front & side, stability control/traction control).	Available online (vehicle specs, taxes, registration) Phone calls (loan rates, bank fees)	290 banks/ credit unions
	Vehicle insurance	Auto Insurance Premium	Insurance premiums for 2017 Ford Fusion SE 2.5L Automatic with liability policy limits of $25,000/$50,000/$100,000, $50,000/$100,000 uninsured motorist coverage and with a $500 deductible. For a 35-yr old male driver, married, principal operator, drives less than 15 miles to work each way, no accidents or traffic convictions in three years.	Available online	16 providers in 24 cities
	Healthcare	Health Insurance Premium	Prices of health care insurance premiums for a 40-year old. Average price of "Bronze" and "Silver" health insurance premiums.	Available online	2 to 6 per MSA

HOUSING – SHELTER – MORTGAGE PAYMENT/PROPERTY TAXES

Home values were provided to Corona Insights by the Colorado Legislative Council via a study by an outside consultant, and they were based on a specified home size. This is the same approach used in previous years. Corona Insights calculated an annual mortgage payment (principal and interest) based on a 30-year fixed rate mortgage for 80 percent of the home value with the current mortgage interest rate for Colorado on the day the home values were delivered to Corona Insights.

Owners of residential homes are subject to property tax on their dwelling. The entire value of the home is not taxed; only the assessed value of the home can be taxed. The assessed value of a home is the actual home value multiplied by an assessment percentage. This assessment percentage is the same for the entire state of Colorado and is 7.15% for 2019. The assessed value of the home is then multiplied by the decimal equivalent of the total mill levy. The total mill levy is the sum of the mill levies from the county, city, school district, and any other special levies an area may have. To get the decimal equivalent of a mill levy, the levy is multiplied by .001.

Mill levies were obtained from the 2018 annual report for the Department of Local Affairs. This report was the most recent report available from the Division of Property Taxation. The report included mill levies for every county, city, school district, and any other applicable levy in the state of Colorado. The mill levies were summed by school district. The stated home price for each school district was multiplied by the assessment percentage to get the assessed value. The assessed value was multiplied by the total of all applicable mill levies for the district (county, school district, average municipal value in the county, and any special levy) to calculate the property tax. This process was repeated for all school districts.

HOUSING – SHELTER – HOMEOWNER'S INSURANCE

Homeowner insurance rates were collected from the most recent Homeowners Insurance Premiums Report provided to Corona by the Colorado Department of Regulatory Agencies, Division of Insurance. Rates in this report were drawn from a survey of insurance providers that the Division of Insurance conducts annually; data in the report was current as of July 2018. Premiums were for a coverage period of one year and were based on full replacement cost coverage. Premiums were calculated based on a HO-3 policy, which is the most commonly written policy for a homeowner. The HO-3 policy assumed the home was frame structure, 10 years old, equipped with dead-bolt locks and smoke detectors, was within 5 miles of a fire station, and was within 1,000 feet of a fire hydrant. The policy limits were based on a dwelling replacement cost of $200,000, a contents replacement of $160,000, personal liability of $100,000, medical expense of $1,000 and a $500 deductible. These specifications were also used in the 2017 and 2015 studies.

The Homeowners Insurance Premiums Report included premiums in 24 cities spread throughout Colorado from 64 insurance companies. To better represent "typical" homeowner insurance rates, Corona excluded insurance companies that made up less than one percent of the Direct Written Premium market share in Colorado. Thus, our analysis included premiums from the 15 largest homeowner insurance providers, which in aggregate, make up 77 percent of the Colorado homeowner insurance market. We averaged the premiums from these 15 insurance providers for each of the 24 Colorado cities in the report. Lastly, to derive homeowner insurance premiums for each school district, Corona predicted premium rates in districts that were not already represented in the insurance data, based on spatial patterns of the 24 cities from which we did have data. This interpolation method was also employed to predict homeowner insurance rates in the 2017 and 2015 studies.

HOUSING – SHELTER – RENT

Home rental costs were primarily based on median gross rent estimates for a 3-bedroom home by school districts. The data source was the U.S. Census Bureau's 2013-2017 American Community Survey (ACS) 5-year estimates (e.g., table B25031). The universe was all renter-occupied housing units paying cash rent. This dataset provided rent estimates for 159 of the 178 school districts. However, the margin of error of the median gross rent estimate was relatively large (i.e., margin of error was either larger than $140 or was greater than 20 percent of the estimate) for 59 of the 159 school districts. In some of these districts, the margin of error for the median rent of a 2-bedroom unit was acceptable (i.e., margin of error was either less than $130 or was less than 20 percent of the estimate). In these districts, we inflated the rate of the 2-bedroom estimate by the average percent difference between 2-bedroom and 3 bedroom medians estimates (among districts with margins of error below 15 percent of the estimate for both the 2- and 3-bedroom estimates) within its region (regions were classified as school districts in the Easter Plains, Front Range, Mountain Resort Communities, or Non-resort Communities). In three cases, we decided using the 3-bedroom estimate was more appropriate than inflating the 2-bedroom estimate, even when the 3-bedroom estimate had a relatively large margin of error.

Using this approach, we estimated median gross rent for 24 districts and relied on the ACS estimate for 100 districts. This left 54 districts without rent values. To calculate the cost to rent for these remaining districts, we used an interpolation technique, which predicted rental costs based on spatial patterns within the districts for which we had rent estimates.

Next, we added renter's insurance costs for each school district. Akin to collecting and calculating homeowner insurance premiums as described above, Corona collected renter's insurance policy premiums provided to Corona by the Colorado Department of Regulatory Agencies, Division of Insurance. Premiums were calculated for a HO-4 policy, which assumed the home was a frame structure. The policy limits included contents replacement cost of $40,000, personal liability of $100,000, medical expense of $1,000 and a $500 deductible. Finally, to derive homeowner insurance premiums for each school district, Corona used a spatial interpolation technique to predict premium rates in districts that were not yet represented, based on spatial patterns of premium rates among the 24 cities provided by the Division of Insurance.

HOUSING – UTILITIES – ELECTRIC

To estimate an average monthly electric bill within each school district, Corona calculated standardized electric rates by provider, allocated those rates to census blocks in each provider's service area, adjusted electric use based on local climate, applied location specific utility taxes, and then calculated an average electric bill within each school district. Specific details follow.

Electric utility rates were collected from the most recent survey of electric utility providers, which was conducted by the Colorado Association of Municipal Utilities (CAMU). CAMU collected billing rates, based on 700-megawatt usage, from Colorado electric utilities in July 2018 and July 2019. These rates include tax equivalents, either the exact PILOT (payment in lieu of taxes) or transfer to the municipal general fund, but did not include county or municipal sales tax. We used the most recent rate available for each utility. The CAMU dataset did not include rates from the towns of Center, Holyoke, Yuma, or Haxtun, so Corona collected these rates by calling the municipal utilities.

Next, Corona retrieved the Electric Retail Service Territories global information system (GIS) shapefile from the United States Department of Homeland Security, Homeland Infrastructure Foundation – Level Data (HIFLD). We appended the CAMU electric rates to each electric provider.

The 2013 cost of living study acknowledged that electricity usage likely varies across geographies based on climate. For example, households in Southeast Colorado, where summer temperatures are typically much higher than elsewhere in the state, likely use more electricity for home cooling. In this study, Corona accounted for this disproportionate use by applying an upward adjustment factor for households in counties where the average June to September temperature was higher than the average statewide June to September temperature, as reported by the National Oceanic and Atmospheric Administration, National Centers for Environmental Information. For example, Corona applied a 1.13 use adjustment factor for households in Pueblo County, where the average summer temperature was warmer than the statewide average.

Leveraging GIS, Corona then overlaid the electric utility provider and rate map with the climate map and a map including every census block (with number of household counts), town/city, county, and school district in Colorado. We then calculated aggregate electric bills within each block based on utility rates, use adjustments for four summer months, and local utility sales taxes. Lastly, we calculated average electric bills for each school district based on the aggregate electric bills and number of households within each district.

HOUSING – UTILITIES – GAS

To calculate the average monthly natural gas bill within each district, Corona used a methodology foundationally similar to that described above for electric providers. We calculated standardized natural gas cost rates by utility provider, calculated propane equivalent rate, allocated the appropriate gas or propane rate to every census block in Colorado, adjusted natural gas use based on local climate, applied location specific utility taxes, and then calculated an average natural gas bill within each school district. Specific details are described below.

Natural gas costs were collected from the most recent annual reports that utilities had filed with the Colorado Public Utility Commission. These reports contain annual residential revenues collected in 2018, the number of residential customers for each of the providers' service areas, and the amount of natural gas delivered to residential customers in 2018. We used the revenue data and the amount of gas delivered data to calculate the amount of dollars paid per Therm of natural gas delivered. Then we calculated the cost to receive 62.5 Therms per month, which is a typical amount of natural gas for a single-family home. By standardizing the rate to dollars per Therm, rather than dollars per customer, we can accurately calculate and compare the cost for equivalent service.

After calculating natural gas rates by provider service area, we acquired and used the natural gas utility provider territory log from the Colorado Department of Regulatory Agencies, Public Utilities Commission to assign natural gas utility service areas and rates to 295 census designated places (e.g., cities, towns, and other housing developments) throughout Colorado. In a few cases, two natural gas providers were assigned to one census designated place, in which case we averaged the rates of the two providers.

Many households in Colorado, especially in rural areas, do not have access to natural gas services, and these households typically rely on propane (a type of liquid petroleum) for home heating. In this study, we assumed that households within a census designated place received natural gas service and households outside a census designated place used propane. Corona used data from the Energy Information Administration to calculate the cost for propane relative to the cost of natural gas, based on the average residential prices for natural gas and propane in Colorado, the total amount of natural gas and propane consumed in Colorado, and the actual energy output for each fuel type in British Thermal Units. The relative conversion factor was 3.06, meaning for each dollar spent for natural gas would require $3.06 for an equivalent amount of propane. The final cost of propane service was calculated by county as the average natural gas rate within each county multiplied by the statewide conversion factor. Each census block outside a census designated place was assigned a local propane rate.

The 2013 cost of living study acknowledged that natural gas usage likely varies across geographies based on climate. For example, households in mountains or mountain valleys, where winter temperatures are typically much lower than elsewhere in the state, likely use more natural gas for home heating. In this study, Corona accounted for this disproportionate use by applying an upward and downward adjustment factor for households based on their county's average November to February temperature relative to the average statewide November to February temperature, as reported by the National Oceanic and Atmospheric Administration, National Centers for Environmental Information. For example, Corona applied a 1.19 use adjustment factor for households in Alamosa County, where the average winter temperature was cooler than the statewide average.

Leveraging GIS, Corona then overlaid the natural gas utility provider and rate map with the climate map and a map including every census block (with number of household counts), town/city, county, and school district in Colorado. We then calculated aggregate natural gas bills within each block based on the dollar per Therm rates, use adjustments for climate, and local utility sales taxes. Lastly, we calculated average natural gas/propane bills for each school district based on the aggregate electric natural gas/propane bills and number of households within each district.

HOUSING – UTILITIES – TELEPHONE

Consistent with the two previous cost of living studies, telephone service pricing was assumed to be essentially constant across the state and the variance between districts comes from the taxes and fees. As such, we began with a constant cost of $132 per month, which was the typical spending amount from the CES data. As with other taxable services, applicable taxes were applied for each census block in Colorado. First, we applied state and county normal sales taxes, and city sales taxes where applicable. This differs from the 2017 and 2015 studies, which applied average utility taxes instead of normal sales taxes. Next, we applied 911 surcharges, which are typically county specific. Then we applied flat state and federal Universal Service Fund taxes and a flat TDD tax.

Leveraging GIS, Corona applied the appropriate total phone tax to the flat bill of $132 for every census block (with number of household counts) in Colorado. We then calculated aggregate phone bills within each block, and from that calculated an average household phone bill within each district.

HOUSING – UTILITIES – WATER/WASTEWATER

To estimate an average monthly water and wastewater bill within each school district, Corona calculated standardized water and wastewater cost rates by utility provider, calculated well and septic equivalent rates, allocated those rates to every census block throughout Colorado, applied location specific utility taxes, and then calculated an average water and wastewater bill within each school district. Specific details follow.

Water and wastewater rates were gathered by calling water and wastewater utilities or by searching for their rates online. Where applicable, rates were for three-quarter inch pipe size, and we used one single family equivalent (SFE) when rates were determined by house size. Corona collected rate information from 276 utilities throughout the state, providing water or wastewater to 281 of Colorado's census designated places (e.g., cities, towns, and other housing developments). Most water utilities were municipal, but some were water and sanitation districts. We attempted to collect rates from an additional 25 utilities at small municipalities but received no response. In very limited cases, proxy values, based on the rates charged by nearby and comparable utilities, were used when we received no response from a utility, but more commonly we used well and septic estimates (described below).

After rates were collected, Corona calculated a monthly water and wastewater bill for each utility based on a home that uses 11,000 gallons of water per month and produces 5,000 gallons of wastewater for processing per month. We then assigned utilities and their average bill to census designated places. In a few cases, two water or wastewater providers were assigned to one census designated place, in which case we averaged the rates of the two providers.

Many households in Colorado, especially in rural areas, do not have access to utility water or wastewater services, and these households typically rely on private well water and septic systems. In this study, we assumed that households within a census designated place received utility water and wastewater service and households outside a census designated place relied on wells and septic systems. Additionally, when no contact information could be found or we received no response from a utility, or when municipal officials told us households in their area used only wells and septic systems, we applied a well and septic rate. Well water costs were calculated based on well installation, operation, and maintenance costs described online (https://homeguide.com/costs/well-pump-cost#repair). We assumed a pump and installation (not including drilling) would cost $2,000 and last 15 years, resulting in an annual cost of $133. Additionally, we calculated operation, maintenance, and testing costs of $166 per year, for an annual total of $300 and a $25 monthly cost. Septic system costs were calculated based on installation, operation, and maintenance costs described online (https://www.homeadvisor.com/cost/plumbing/install-a-septic-tank/). We assumed a tank would last 20 years and would cost $3,600 to install and $2,000 to maintain during that time span, resulting in $280 annual cost and $23 monthly cost.

Leveraging GIS, Corona overlaid a map of census designated places, and each places' appropriate water and wastewater bill, with a map including every census block (with number of household counts), county, and school district in Colorado. We then calculated aggregate water and wastewater bills within each block based on the average utility rate for blocks within census designated places or by the well and septic estimates for the remaining blocks. We applied local utility sales taxes as applicable. Lastly, we calculated average water and wastewater bills for each school district based on the aggregate district bill and number of households within each district.

HOUSING – HOUSEHOLD OPERATIONS – DAY CARE

Day care costs incorporated in this study were based on information provided in The Self-Sufficiency Standard for Colorado 2018. This study was prepared for the Colorado Center on Law and Policy by the Center for Women's Welfare at the University of Washington School of Social Work. Specific childcare costs for an infant (ages 0 to <3), a preschooler (ages 3 to <6), and a school-aged child (ages 6 to <13) were collected for each county in Colorado and then weighted by the proportion of children in care for each grouping, as reported by the Department of Health and Human Services data on children participating in Child Care and Development Fund (CCDF)-funded programs (Table 9 in their Fiscal Year 2018 publication).

Final average day care costs were reapportioned from the county level to the school district level by calculating the proportion of households within each district and county combination, then weighting the average day care costs by those proportions. For example, in the St. Vrain District, 71% of households are located in Boulder County while 29% of households are located in Weld County. The day care estimate for St. Vrain District is the sum of 71% of the Boulder County day care average and 29% of the Weld County average.

TRANSPORTATION – VEHICLE PAYMENTS

Vehicle pricing was gathered for a 2017 Honda Civic LX Sedan. The purchase price of the 2017 Honda Civic was $14,650 (per Kelley Blue Book information assuming the vehicle had 24,000 miles at the time of

purchase). This was the base price used to determine annual car payments for a four-year loan. This price was assumed to be constant throughout the state, which ensures that the identical vehicle is being purchased in each district. With a used car purchase, not only is availability of a specific model limited across districts, but the specific condition and features on each available vehicle can vary widely making it impossible to compare available pricing for a specific vehicle. Instead, the vehicle value is held constant at the KBB value, and the variance between districts comes from the sales and registration taxes and fees, as well as the financing rates and fees available. Ownership taxes, registration & licensing fees, other fees (title) are provided in the "Colorado Motor Vehicle Law Resource Book" from the Colorado Legislative Council. The vehicle weight is also required for calculating taxes; this was obtained from the vehicle manufacturer's website. Sales taxes were calculated for each taxing jurisdiction and averaged for each district, weighted to the proportion of households within each taxing jurisdiction.

Financing rates for vehicle loans were obtained from telephone surveys of 290 banking institutions and credit unions throughout the state. The list of banking institutions to survey was obtained from D&B Hoovers and a sample was drawn as described in the previous section of the report. Banking institutions were mapped to the bank's physical location, and each bank's finance rate and total fees (e.g., filing fees) was appended to that location. Then, Corona used a spatial interpolation technique to predict financing rates and fees for every school district based on spatial patterns across the 290 institutions. Average monthly car payments were then calculated for each district, given the total amount financed (including the purchase price, all bank loan charges, and any applicable tax, title, and registration fees) and the interest rate charged by the bank or credit union.

TRANSPORTATION – VEHICLE INSURANCE

Vehicle insurance rates were collected from the most recent Auto Insurance Premiums Report provided to Corona by the Colorado Department of Regulatory Agencies, Division of Insurance. Rates in this report were drawn from a survey of insurance providers that the Division of Insurance conducts annually; data in the report was current as of July 2018. Premiums were for a coverage period of six months (which Corona adjusted to represent monthly costs) and were based on a basic model vehicle 2017 Ford Fusion SE 2.5L Automatic. Premiums were based on a hypothetical driver who was 35-year-old, male, married, principal operator, driving less than 15 miles to work each way, who had no accidents or traffic convictions in the past three years. The policy included coverage for property damage of $25,000, bodily injury of $50,000 per person or $100,000 per occurrence, uninsured or underinsured motorist coverage of $50,000 per person or $100,000 per occurrence, $5,000 for medical payments, and a $500 deductible. All policy specifications, including car make and model, were pre-determined by the Division of Insurance. These specifications were similar, but slightly higher coverage, than what was used in the 2017 and 2015 studies.

The Auto Insurance Premiums Report included premiums in 24 cities spread throughout Colorado from 73 insurance companies. To better represent "typical" vehicle insurance rates, Corona excluded insurance companies that made up less than one percent of the market share in Colorado. Thus, our analysis included premiums from the 16 largest homeowner insurance providers, which in aggregate, make up 80 percent of the Colorado homeowner insurance market. We averaged the premiums from these 16 insurance providers for each of the 24 Colorado cities in the report. Lastly, to derive vehicle insurance premiums for each school district, Corona used a spatial interpolation technique to predict premium rates in districts that were not represented in the report data, based on spatial patterns of premium rates among the 24 cities in the report. This interpolation method was similarly employed to predict vehicle insurance rates in the 2017 and 2015 studies.

HEALTH CARE

Healthcare insurance premiums were collected from the Colorado Department of Regulatory Agencies, Division of Insurance. All premiums were based on a 40-year old. Low and high premiums were provided by two to six insurance companies for each of nine geographic "rating" areas they served. We first calculated the midpoint between the low and high costs for each company in each rating area. Then we averaged these mid-points for all "Silver" and "Bronze" plans, both on-exchange and off-exchange. Averages by rating area were then assigned to appropriate counties, without overlap. This approach was consistent with the 2017 study.

Final average health insurance premiums were reapportioned from the county level to the school district level by calculating the proportion of households within each district and county combination, then weighting the average premium by those proportions. For example, in the St. Vrain District, 71% of households are located in Boulder County while 29% of households are located in Weld County. The health insurance premium estimate for St. Vrain District was the sum of 71% of the Boulder County premium average and 29% of the Weld County average.

PERSONAL (INCOME) TAXES

Personal income taxes were calculated for the benchmark family in each district using the IRS Form 1040 for 2018 for federal income tax and adding state income tax and occupational/head taxes for relevant local jurisdictions. For federal income taxes, the standard deduction was compared to the itemized deduction calculated using mortgage interest (recognizing allowable limits), as well as specific ownership taxes from the vehicles, state income taxes, and cash contributions based on the CES, and the higher of the two deductions was used for each district. IRS Publication 936 was used to calculate the allowable limits on home mortgage interest deductions for high home value districts (e.g., Aspen). Specific ownership taxes were calculated from the original Manufacturer's Suggested Retail Price (MSRP) value for each vehicle, and the tax formula from the Colorado Motor Vehicle Law Resource Book. Colorado state income taxes were calculated from the formulas in publication, DR 1098 "Colorado Income Tax Withholding Tables for Employers".

Major federal tax reform was enacted for 2018, which included lowering tax rates, increasing the standard deduction, suspending personal exemptions, increasing the child tax credit, and limiting or discontinuing certain deductions. As a result, for all districts except Aspen 1 (which has the highest deduction for mortgage interest, even recognizing allowable limits), our calculation found the standard deduction to be greater than itemized deductions. The new tax rules have greatly reduced variability in the index due to income taxes.

ALCOHOL, TOBACCO, APPAREL, READING, EDUCATION, MISCELLANEOUS EXPENSES, CASH CONTRIBUTIONS, AND PERSONAL INSURANCE AND PENSIONS

Mirroring previous cost of living studies, the major expenditure categories for Reading, Education, Miscellaneous Expenses, Cash Contributions, and Personal Insurance and Pensions were not sampled in this 2019 Cost of Living study. Similar to the previous studies, these expenditure categories were expected to be constant for the relevant benchmark family and were thus held constant for all districts. No significant geographic variation or trends were expected to be seen for these goods, and the final costs for each district came directly from the benchmark family's spending level calculated for each category from the *Consumer Expenditure Survey*.

This year, expenses for Alcohol, Tobacco, and Apparel categories were also held constant for all districts. More information about this change can be found in Appendix B.

3.5 IDENTIFYING AND MEASURING GEOGRAPHIC SHOPPING PATTERNS

If every resident in a school district made all of their purchases within a school district, calculating the cost of living in that district would be straightforward. However, this is not the case. Often, residents leave their district to make purchases, either because an item is not available in their home district, they can obtain a better price, better selection, more convenience, or some other benefit. Because prices will vary across district boundaries (sometimes notably), it is necessary to understand these geographic shopping patterns in order to develop the actual cost of living in each school district.

In 2019, Corona Insights conducted a survey of residents of each district to gather input about where they most recently purchased a series of goods. The data from these surveys, in conjunction with mathematical modeling methods, were used to construct a geographic shopping matrix describing where the residents of each school district typically purchase particular products (i.e., what proportion of purchases are made in the home district, in each neighboring district, online, etc.).

For cost of living studies conducted from 1997 through 2005, geographic shopping patterns were estimated based on a large statewide survey that was conducted in 1997. From 2007 through 2017, geographic shopping patterns were estimated based on a large statewide survey that was conducted in increments in 2007, 2009, and 2011. In 2019, the Colorado Legislative Council prioritized creating an updated shopping patterns model. The shopping patterns database was updated this year for the first time since 2011.

The research team designed a survey that asked about geographic purchasing patterns for a variety of products. For smaller purchases, respondents were asked where they or a member of their household most recently purchased each item. Residents outside metro areas were asked about the town where they purchased the item, while residents within the Front Range were asked what "zone" they purchased the item in with the zones corresponding to school districts (a colored map was provided with the survey with zone outlines). Residents were also allowed to state that they bought the product online, or that they never buy the product.

For the larger expense, less frequently purchased products, such as a television or appliance, residents were asked if they had purchased in the past 2 years; and if so, whether they were living in their current region when they bought each one. If they were living in their current region when they made the purchase, they were then asked what city (or "zone" for Front Range residents) they purchased any such items in (which could include "online"). For those who lived elsewhere, or had not purchased in the past 2 years, they were asked what city, or zone, they thought they would go to if they were going to buy these items. These less frequently purchased products were asked in a different manner because for some of these products, the person could have made the purchase several years earlier when living in a different place, or they could simply not remember if their last purchase was several years ago.

Corona created a draft of the survey, including maps, and conducted a small pilot test in the Denver metro area. Based on those results – primarily how people interpreted questions and instructions – we created a revised survey instrument. The full survey instrument and materials can be found in Appendix E.

In addition to survey design, Corona created a survey sampling plan. Survey sampling is the process of deciding which households and how many households will be asked to reply to a questionnaire. At a micro level, Corona created address-based sampling (ABS) plans for each of the 178 school districts in Colorado. At a macro level, we thoughtfully allocated resources (i.e., survey packets available to mail) to maximize and balance the number of responses from each district.

First, we determined that by equally distributing resources, we could mail survey packets to 168 households in each of the 178 districts. However, we decided it was better to oversample (i.e., mail more than an equal number of survey packets) some districts that we expected had a high proportion of out-of-district shopping, such as Cheraw District. More completed surveys from these districts (typically rural or small and adjacent to more populated districts) would result in a lower margin of error, which would have a far greater positive impact on the confidence of the shopping pattern results. On the other hand, we could reduce the number of packets mailed to districts that we suspected had very little out-of-district shopping, such as Poudre District.

Second, we also consulted imputation percentage results from the Census Bureau's American Community Survey to flag school districts where we might expect lower response rates. We slightly increased the number of survey packets mailed to these districts. Finally, in ten districts, we acquired fewer households mailing addresses than called for in our sampling plan, in which case we mailed survey packets to all available addresses in those districts. In total, we mailed survey packets to 30,295 addresses.

The survey was primarily executed via mail. Mailed packets included a cover letter, survey instrument, map (where needed along the Front Range), and postage-paid return envelope. Shortly after the full survey packet was mailed, a postcard reminder was sent to all survey recipients to further encourage response. An incentive was also offered in the form of a prize drawing. Respondents could enter to win one of five $50 Visa gift cards. As required by law, an alternate mode of entry was also provided.

As data collection proceeded, Corona monitored responses by district and deemed it necessary to boost response. Due to the overall project timeline, this was done via two methods: (1) Corona sent 3,910 postcards to a new sample of mailing addresses, encouraging residents in the household to respond to the survey online. Postcards were primarily sent to small and rural districts. Each household received a unique one-use access code. The same incentive described above was used. (2) Corona worked with an online sample provider (Dynata) to collect additional responses online via their panel. Corona screened all participants to ensure eligibility and a small incentive was provided via Dynata. For both online surveys, the survey was programmed to mimic the paper survey to reduce any mode differences. A total of 3,368 (2,078 via the first mail survey, 1,275 via the panel survey, and 15 via the postcard survey).

Using the data gathered in this survey, the research team developed a family of predictive models to estimate geographic shopping patterns in each district for each product category. As a first step, the team reviewed all responses and assigned each home and purchase location given by respondents to an individual school district. In cases where a city provided by a respondent included multiple school districts, the response was assigned to one of the possible school districts in that city based on a randomization function weighted by the number of businesses in the city that were located in each school district. Purchase locations outside of Colorado were removed from the analysis.

After all responses were assigned to a district, the team further cleaned the data by individually inspecting any purchase districts that were more than 100 driving miles from the respondent's home location. If the purchase location was in a major city or in a city in the same region of the state, it was deemed to be valid. However, in cases where the purchase location was in a completely different region of the state, that data point was removed from the analysis as an outlier.

Once the data were fully cleaned, the team developed predictive models to forecast the purchase district(s) and proportions of purchases from each purchase district for residents of each district. For example, the team developed data that show what proportion of haircut purchases by residents of District A were made in Districts B, C, D, etc. The goal of this was to take into account the prices of goods not only in a district's own business community, but also in other nearby communities. Depending on the particular geography, shopping patterns for any district might include only one district where shopping occurs or might include many districts. The final shopping patterns matrices are presented in Appendix F.

3.6 DEVELOPING FINAL COST OF LIVING MEASURES

After the collection of all pricing data and shopping patterns data, two major steps were taken to develop the final cost of living measures. First, the price data for the market basket items was weighted by the shopping patterns model in order to develop prices for each district that reflect where people in the district purchase their items. Second, annual expenditures are calculated by determining the ratio of the district average price to the statewide average price for each good and then multiplying that average by the typical expenditure on that item according to the Consumer Expenditure Survey. This second step scales up costs so that the limited numbers of (for example) grocery items for which data were collected represent the full annual expenditures for food for the benchmark household. Each of these steps is described in further detail below.

INTEGRATE PRICE DATA WITH SHOPPING PATTERNS SURVEY

As previously described, people do not make all their purchases in the school district in which they live. The shopping patterns survey gathered data on where people shop for 15 categories of items and services: produce, perishable groceries, non-perishable groceries, alcoholic beverages, household products, clothing and shoes, gas, car maintenance and repair, small appliances, tobacco, TVs, and where they go for movie theaters, haircuts, pizza restaurants and other restaurant meals. For each of these items, Corona Insights developed matrices that specify where people living in each district shop for each item, based on the proportional location of surveyed shoppers' most recent purchases. For example, people who live in the Denver County school district may buy gasoline in not only Denver but also neighboring school districts such as Adams-Arapahoe, Boulder Valley, Brighton, Cherry Creek, Jefferson County, and others. By multiplying the shopping patterns matrices that link "home district" with "shopping districts", regional variations in costs and shopping preferences are reflected.

In any instances where people reported shopping in a district where a price was not able to be gathered, the proportion of shopping attributed to that district is redistributed proportionally among the other districts where people reported shopping and where prices were gathered.

CALCULATE ANNUAL EXPENDITURES

Calculating the annual expenditures for each district involved determining the district average price for each item, weighting that price by the proportion of teachers in the district to calculate a state average price, calculating the ratio of the district average price to the state average price, and then multiplying that ratio by the typical expenditures in a category according to the Consumer Expenditure Survey. These steps are elaborated below.

Mirroring the methodology used since the 2007 cost of living study, the majority of the market basket items were sampled by school district in 2019. This helped to ensure that all final cost of living data was specific to an exact school district. In a few cases, the data were only available at a county or region level, and needed to be applied to districts based on location. Utilities prices, day care prices, and insurance prices are a few of the cases where data was available at the county or region level and had to be applied to districts. In these cases, the county (or other) price was assigned to each district located in that county in order to arrive at a price for each district.

Statewide average prices were then calculated by weighting the average price in each district by the proportion of the state's teachers in that district and then adding together the weighted prices for all districts. District average prices were then compared to state average prices by calculating the ratio of the district average price to the state average price. These ratios were then multiplied by the typical expenditure for the category

according to the Consumer Expenditure Survey in order to determine a final annual expenditure on that item for each district.

This process was repeated for each market basket item, and then all of the expenditures on items in a common category were added to determine annual expenditures for that category (i.e., categories include food at home, food away from home, housing, transportation, etc.). Finally, annual expenditures in each category were combined to provide total annual expenditures for each district.

CALCULATE CONFIDENCE INTERVALS

Confidence intervals were also calculated for most expenditure categories to estimate the uncertainty in the prices available to consumers in each district. For each district sampled, the variance of the mean (i.e., standard error), was calculated for the prices obtained from that district. These variances were weighted by the shopping patterns for each district and the teacher populations to calculate a state average variance. Then ratio variances were calculated by comparing the variance for a district to the state average variance. Ratio variances were aggregated over items in a category and a confidence interval was calculated for the category as a whole.

Essentially, large confidence intervals reflect a large variance of the mean, which means there is a large variability in the prices collected and relatively few prices collected. In some cases, variability in the error may be reduced by additional sampling in those districts; however, this is only likely to be true in large districts where the universe of stores available to sample from is large. In, for example, a small, rural district with only one substantial grocery store, where a convenience store has also been sampled, the variance of the mean will be large, but sampling additional convenience stores (if any are available) is likely to only artificially inflate the mean price for the district, because convenience stores tend to charge higher prices than grocery stores. In cases like this there is a tradeoff between reducing error variability and accurately estimating the cost of living in a district. Whether additional sampling is needed should be evaluated on a case by case basis. It should be noted that other factors in addition to the variability of the mean district price will affect uncertainty in the cost of living indices, but currently no additional factors are incorporated in the confidence interval estimates. See Appendix C for a more detailed discussion of statistical measures used in this study.

APPENDIX A: DETAILED RESULTS

Appendix A provides an additional level of detail about the results of the study, breaking out costs of living in each district by major expenditure category.

Results are provided both in visual form, through maps provided in this section, and in tabular form in an accompanying spreadsheet. Readers receiving this report electronically will need to review an accompanying spreadsheet file, due to the volume of data.

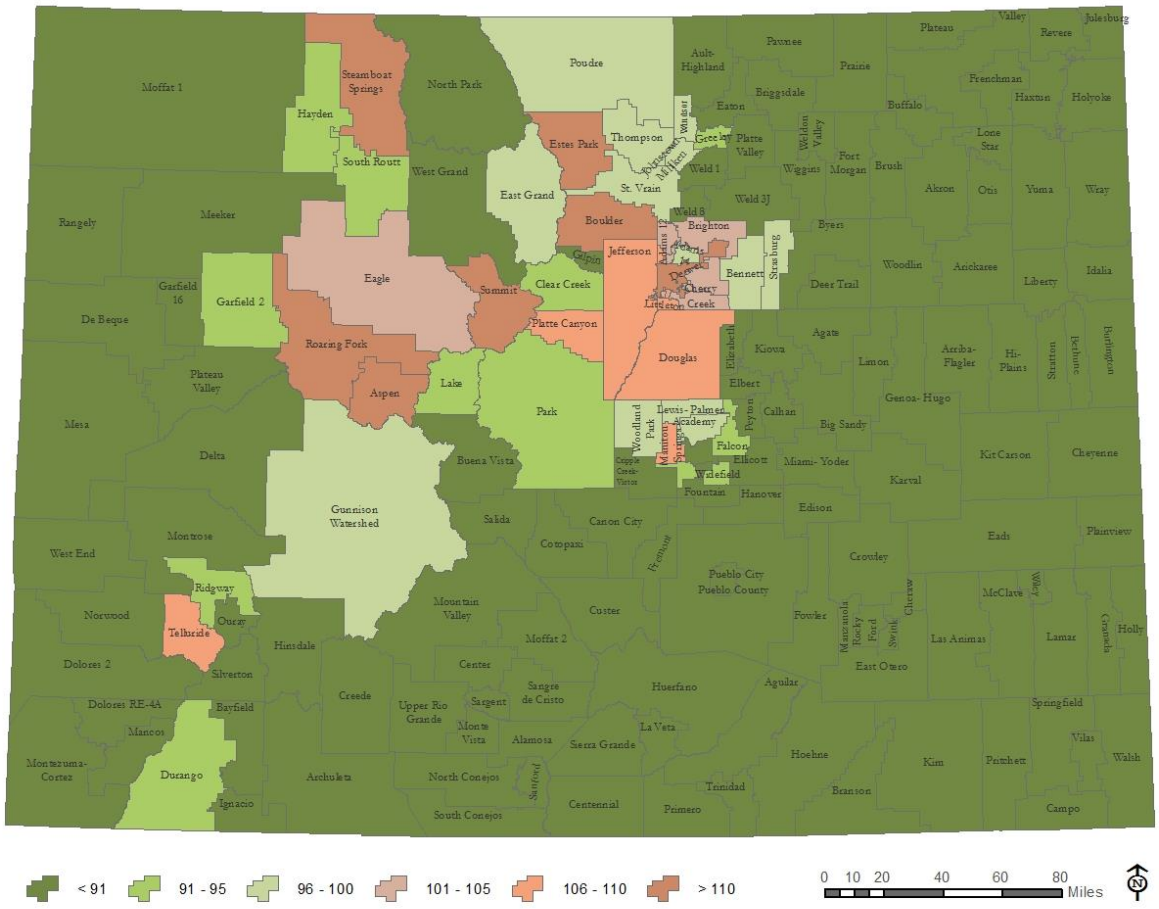
Maps are provided for the four largest expenditure categories: A) housing, B) transportation, C) food at home, and D) healthcare.

Consumer Expenditures for a 3-Person Household Earning $56,547		
Expenditure Category	% of Income 2019	% of Income 2017
Housing	32.3%	32.8%
Transportation	16.9%	17.8%
Food	13.5%	13.1%
Healthcare	8.9%	8.3%
Personal taxes	5.2%	4.9%
Entertainment	4.1%	3.8%
Apparel and services	2.7%	3.0%
Personal care products and services	1.2%	1.1%
Tobacco	0.9%	1.0%
Alcoholic beverages	0.5%	0.6%
Other	13.8%	14.2%
Total	*100%*	*100%*

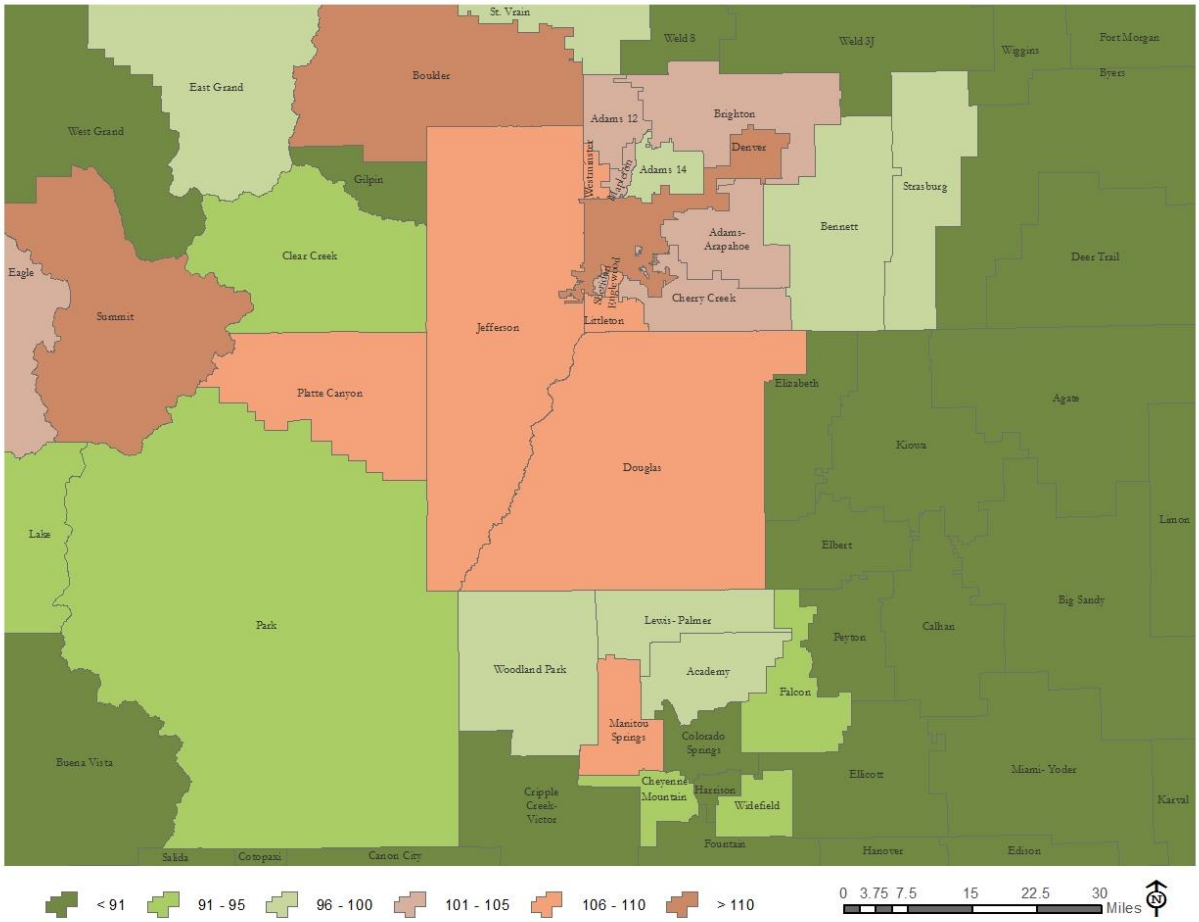
Note. The index value is the ratio of the cost of the housing market basket in each district to the statewide average cost of the housing market basket. In the following maps, shades of green depict less expensive districts while shades of orange depict more expensive districts.

EXHIBIT A: MAPS OF THE **HOUSING** INDEX, 2019

STATEWIDE



FRONT RANGE


St. Vrain
Weld 8
Weld 3J
Wiggins
Fort Morgan
Byers
Boulder
East Grand
West Grand
Adams 12
Brighton
Denver
Adams 14
Westminster
Federal Heights
Gilpin
Strasburg
Bennett
Adams-Arapahoe
Deer Trail
Clear Creek
Eagle
Summit
Sheridan
Englewood
Cherry Creek
Littleton
Jefferson
Platte Canyon
Elizabeth
Agate
Kiowa
Douglas
Lake
Elbert
Lamon
Big Sandy
Park
Lewis-Palmer
Peyton
Calhan
Woodland Park
Academy
Falcon
Manitou Springs
Colorado Springs
Buena Vista
Cripple Creek-Victor
Cheyenne Mountain
Harrison
Ellicott
Miami-Yoder
Karval
Wildefield
Fountain
Hanover
Edison
Salida
Cotopaxi
Canon City
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> 110
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Miles
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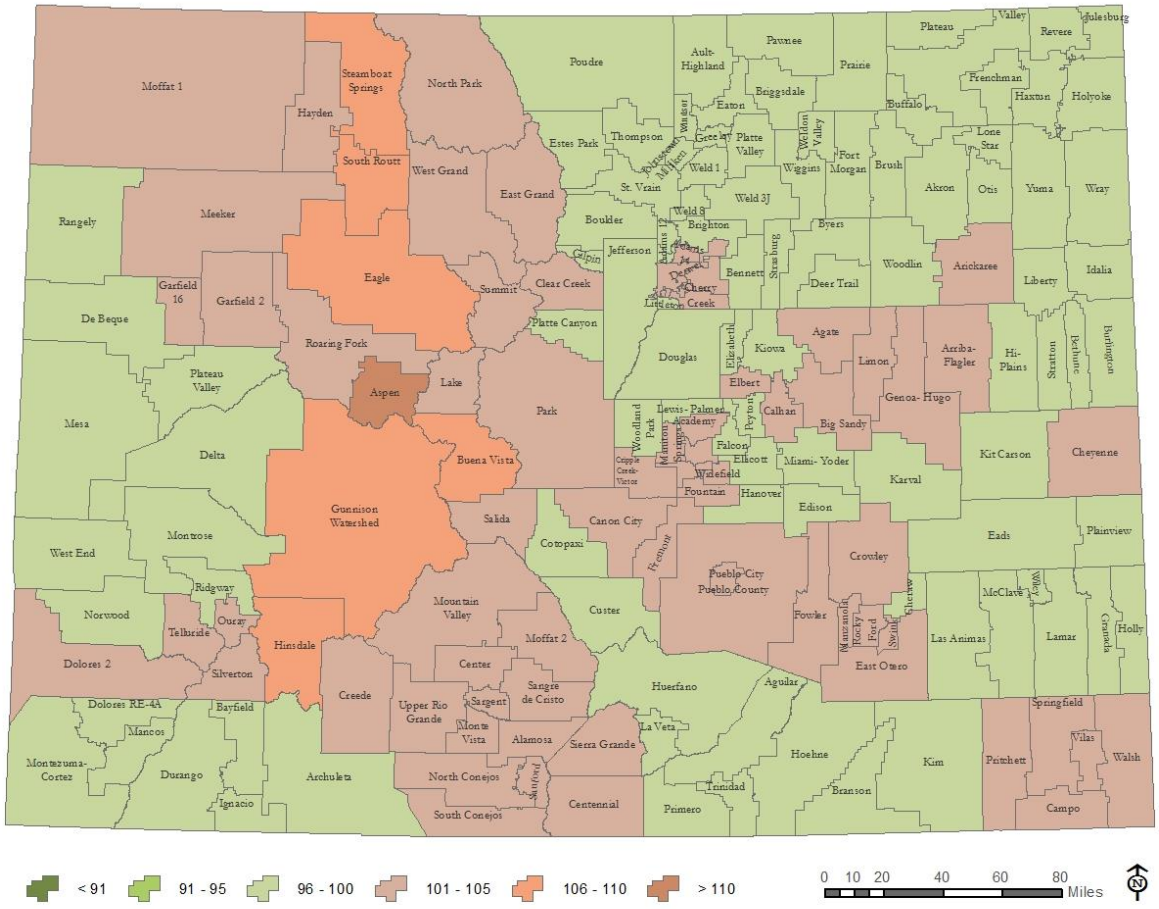
EXHIBIT B: MAPS OF THE **TRANSPORTATION** INDEX, 2019

STATEWIDE



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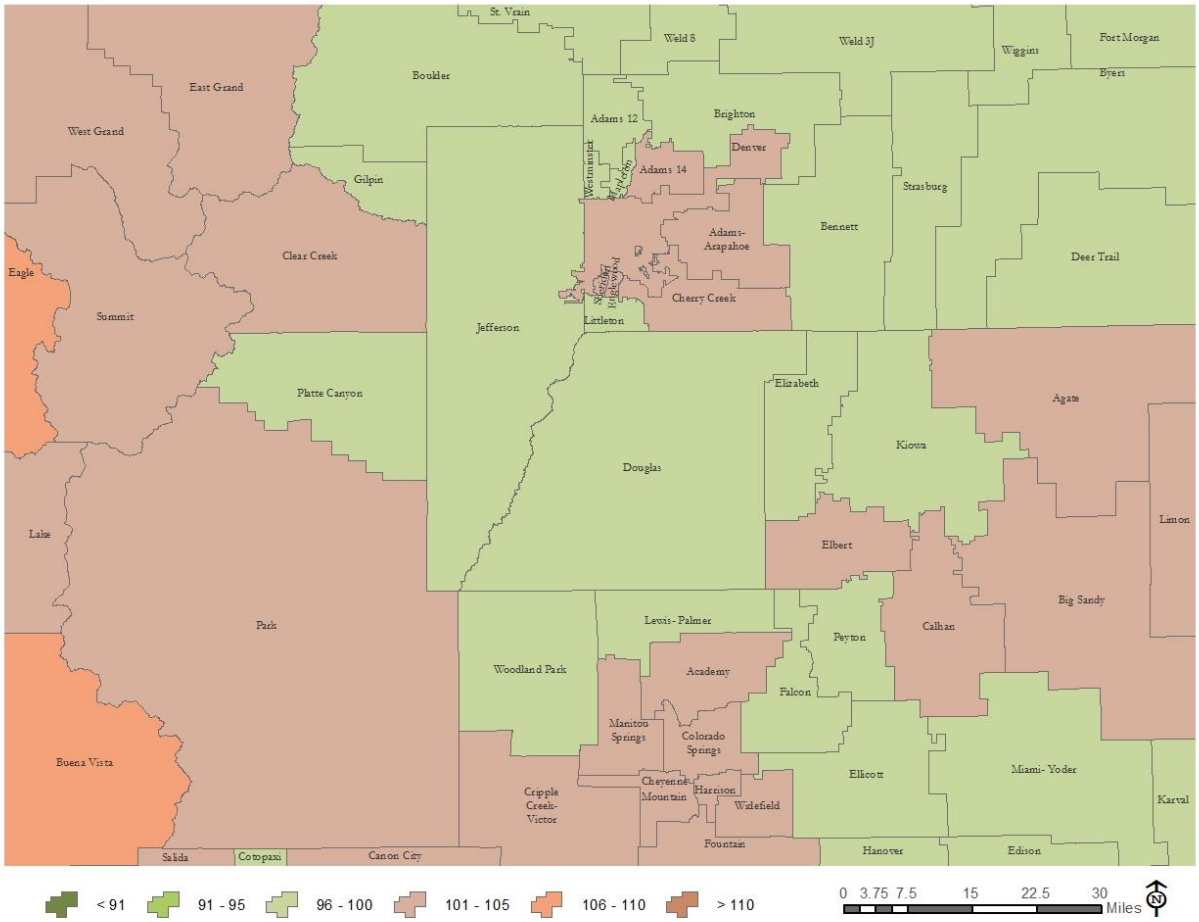
St. Vrain
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Weld 3J
Wiggins
Fort Morgan
Byers
East Grand
Boulder
West Grand
Adams 12
Brighton
Denver
Adams 14
Gilpin
Strasburg
Bennett
Adams-Arapahoe
Deer Trail
Clear Creek
Eagle
Summit
Cherry Creek
Littleton
Jefferson
Platte Canyon
Elizabeth
Agate
Kiowa
Douglas
Lake
Elbert
Limon
Big Sandy
Park
Lewis-Palmer
Peyton
Calhan
Woodland Park
Academy
Falcon
Manitou Springs
Colorado Springs
Buena Vista
Ellicott
Miami-Yoder
Cheyenne Mountain
Harrison
Cripple Creek-Victor
Widefield
Karval
Fountain
Salida
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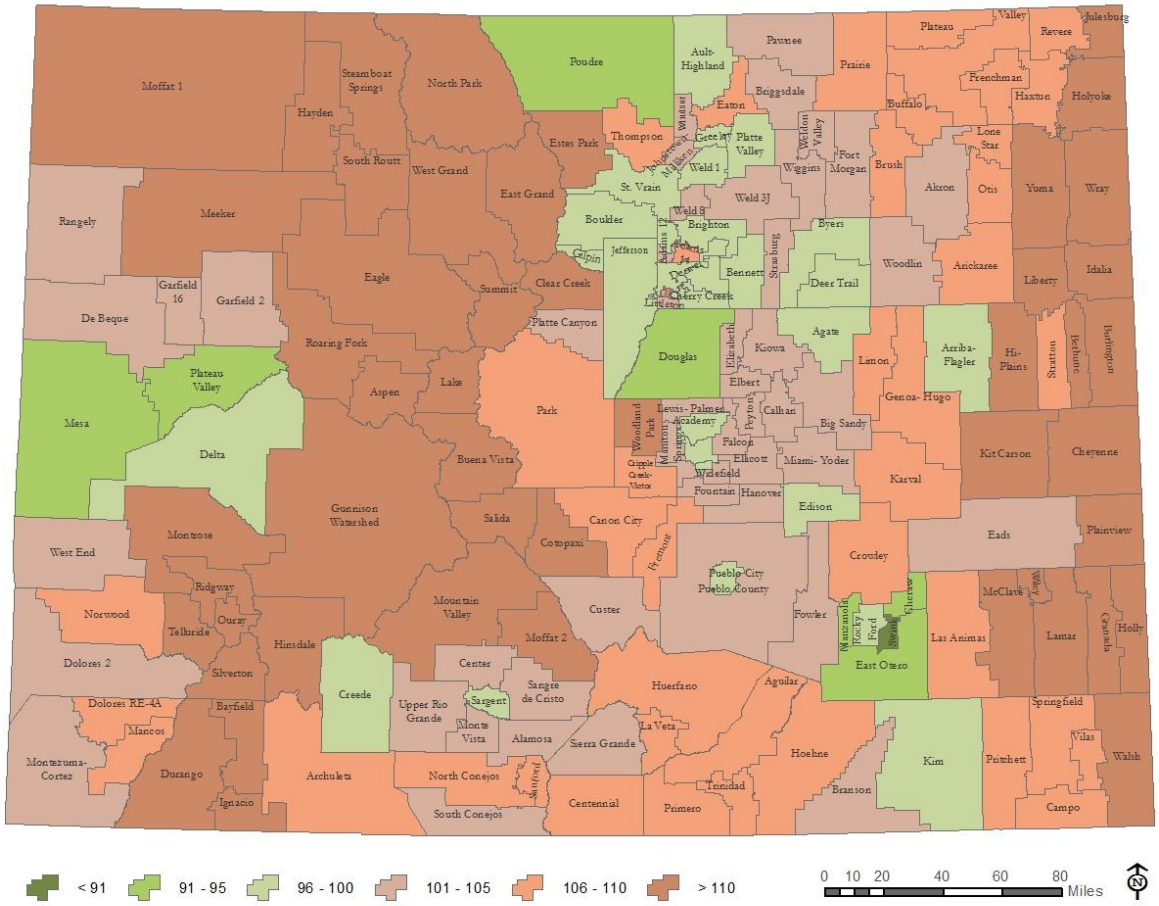
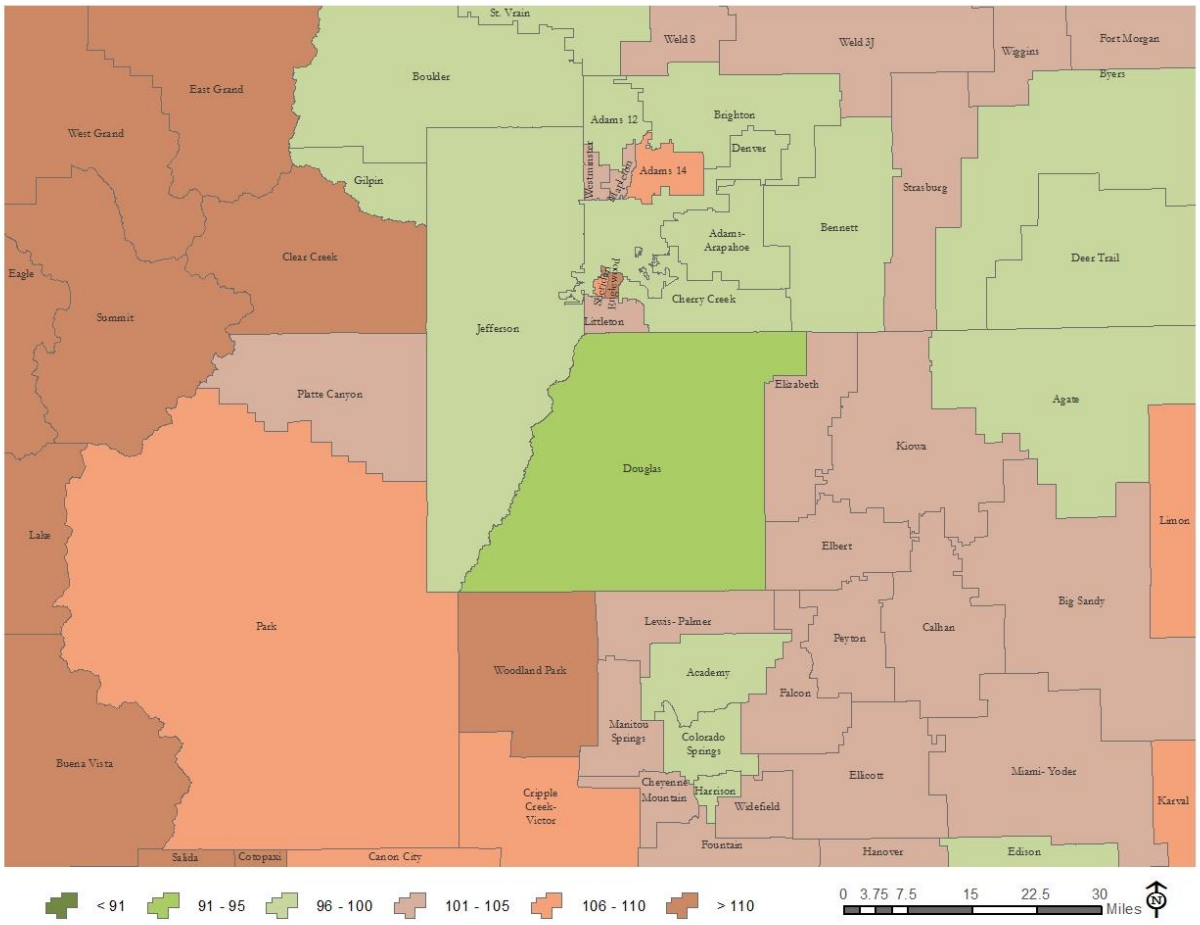
EXHIBIT C: MAPS OF THE **FOOD AT HOME** INDEX, 2019

STATEWIDE



FRONT RANGE


St. Vrain
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Weld 3J
Wiggins
Fort Morgan
Byers
Boulder
East Grand
West Grand
Adams 12
Brighton
Denver
Adams 14
Gilpin
Strasburg
Bennett
Adams-Arapahoe
Clear Creek
Deer Trail
Eagle
Summit
Cherry Creek
Littleton
Jefferson
Platte Canyon
Elizabeth
Agate
Douglas
Kiowa
Lake
Limon
Elbert
Park
Big Sandy
Lewis-Palmer
Peyton
Calhan
Woodland Park
Academy
Falcon
Manitou Springs
Colorado Springs
Buena Vista
Ellicott
Miami-Yoder
Cheyenne Mountain
Harrison
Karval
Cripple Creek-Victor
Widefield
Fountain
Hanover
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Salida
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Miles
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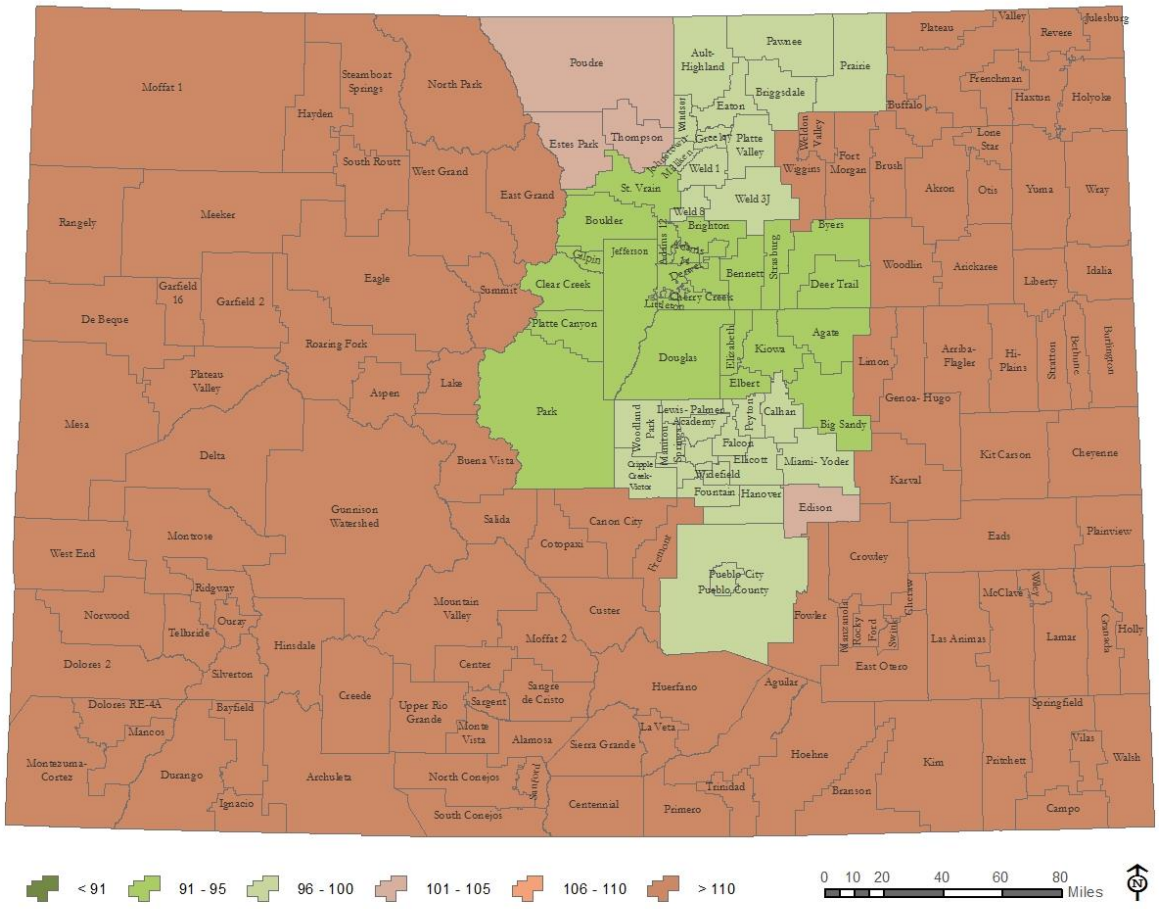
EXHIBIT D: MAPS OF THE **HEALTHCARE** INDEX, 2019

STATEWIDE



APPENDIX B: CHANGES FROM THE 2017 STUDY AND IMPLICATIONS

The 2019 Cost of Living Study includes several substantive changes from previous studies. In planning for the 2019 study, Corona took into account input from the Legislative Council as well as our own review of past years' research. We identified several areas for improvement this year, and then worked to balance the added scope with time and budget restraints. Below we highlight key decisions made as part of this planning process and their impact on the results of the study.

- **Shopping patterns.** Since 2013, the cost of living analysis was supported by a shopping patterns database constructed from survey data collected by Corona Insights in 2007, 2009 and 2011. Although this database included responses from 7,864 households, it had not been updated in nearly a decade. During that time, some areas of Colorado have seen substantial growth or decline in retail market areas, such as along the I-25 corridor or in rural communities. Additionally, national studies have demonstrated a steady increase of online shopping volume. For these reasons, we suggested conducting a large-scale mail back survey to reevaluate the shopping patterns within each district. This investment would ensure the integrity of the final results and index.

  Updating the shopping patterns using a survey approach required a substantial investment, including survey development, mapping, sampling, data entry and analysis, in addition to costs for printing, mailing, and postage. To fit this investment within the budget available for this year's study, Corona researched data patterns from prior studies, searching for opportunities to increase efficiency with minimal loss of data accuracy or reliability. An acceptable approach that we adopted this year was reducing the number of market basket items and collecting prices online or over the phone, rather than in person. We describe these choices and implications below.

- **Reducing the number of market basket items.** In planning for the 2019 study we undertook a significant review of the market basket items. We evaluated how much of overall expenditures were represented by each item, how widely available each item was in recent years, and whether the items captured typical levels of variation between districts for items in their category. For example, in 2017, there were 16 food items included in the market basket and food accounted for 14 percent of spending for the benchmark household; apparel had 6 market basket items and accounted for 3 percent of household spending; personal care had 5 items and accounted for 1% of household spending. Because there is a large cost in data collection for each additional item in the market basket, items representing less than one half of one percent of spending received additional scrutiny. For those items, we examined how widely available they were, with a preference for items where a substantially similar item was available in a large number of districts. Apparel items were especially low on this measure with most items available in only 30 percent of districts, and additional concerns about item consistency across districts. Food and personal care items were more widely available, and there were not large differences between items in availability. Finally, we examined the price variability of items between districts. Items with low variability between districts do not have much impact on the index but incur the same cost in data collection. Of particular note were alcohol and tobacco prices, which had very low variability between districts, and each represented less than one percent of spending. These items were good candidates for including in the items held constant in the market basket. For items like food and personal care, we looked at the range of price variation across items and prioritized items that

were in the middle of the range for their category. To summarize, we included items that best fit four criteria:

1. A commonly purchased item that was representative of the category of spending (i.e., had face validity)

2. The item represented a significant proportion of spending (i.e., greater than 0.5%), and was from the largest subcategory of spending within the category (e.g., fresh fruit was the largest subcategory of spending within the fruit and vegetables subcategory of food at home).

3. Widely available across districts in substantially similar form (e.g., bananas for sale in Cortez are very similar to bananas for sale in Sterling)

4. Where reducing the number of items representing a subcategory, retain the item with an average level of variability across districts. For example, if the category has been represented by three items in the past, and one of those items does not vary at all between districts, and one varies a lot between districts, choose the item in the middle to best represent the range of items in the category. Our analysis found that items within most categories showed similar levels of variation between districts. There were however differences between categories, most notably the low variation in alcohol and tobacco prices, resulting in our recommendation to treat those items as constant spending across districts in 2019.

Finally, to explore the impact of a reduced market basket on the index, we ran simulations with prior year data to calculate the index as if we had collected the reduced market basket rather than the full basket. The implications for the index were minimal, with a very high correlation between outcomes – utilizing the reduced market basket predicted 98 percent of the variance of the previous study.

- **Other changes to the market basket.** In reviewing the market basket items, the item that was least satisfying in terms of our criteria was the refrigerator in the household furnishings and equipment category. It has consistently been a challenge to find an item for this category that is widely available and substantially similar everywhere. The category specifications for this item from CES include both large and small appliances, as well as decorative items, tools, and smoke alarms. We visited a variety of businesses to investigate item availability at hardware and general stores and similarity of items offered across stores. We considered coffee makers, toasters, screw drivers, and smoke detectors among other products, and our assessment was that smoke detectors were the most widely available in a consistent product specification, so we recommended including a smoke detector in the market basket for 2019. Our store visits also revealed that it was going to be harder to price a substantially similar coffee item across stores as there are now many more varieties of coffee sold even within brands. We considered and test shopped a variety of alternative items within the "other food at home" category and determined that a 2-liter bottle of Coca-Cola was the most consistently available product for pricing, so we recommended including this item in the market basket for 2019.

- **Field data collection.** In past years, most retail and dining prices were gathered by in-person visits to stores. While in-person data collection is often ideal, it is cost and time intensive. To free up budget to be applied to the above changes, Corona collected pricing for a reduced set of retail and dining market basket items (e.g., groceries, pizza, etc.) via telephone. Corona first piloted the

concept by test calling a variety of businesses to ensure we could secure accurate prices over the phone. We then visited many of those businesses to establish that we were in fact receiving the correct price. Training guides and scripts were then developed for data collectors.

Some items were able to be collected online. Here again, Corona conducted a test to verify that prices gathered online at these stores would match the price in store. Data collectors were then trained on the specific way to gather these prices online to ensure the right item and store were selected. Stores where prices were collected online included King Soopers/City Market, Target, and Walmart. Other stores, such as Safeway, were tested, but did not prove to be reliable. Not all locations were able to be collected online. In those situations, phone calls were still made.

- **Adding housing rent to the market basket.** It is our understanding that dwelling rent was not included in any of the previous cost of living studies. Prior studies assumed the benchmark household owned the home in which they lived. However, home ownership rates vary substantially across districts, from 92 percent in Elizabeth District to 48 percent in Harrison District, according to the U.S. Census Bureau's American Community Survey. Further, rental costs do not trend exactly with ownership costs. In this study, Corona incorporated dwelling rent to produce a more robust analysis of the cost of living than relying on home ownership costs alone. Including rent notably impacted the influence of extreme housing values (such as in Aspen District) on the overall index and within the housing sub-index.

- **Accounting for geographic overlap.** There are 64 counties in Colorado, 455 census designated places (i.e., cities, towns, and housing communities), 526 ZIP codes, over 246,000 census blocks, and 178 school districts. While a handful of school districts exactly match some of these jurisdictions (e.g., Douglas County and Douglas County School District match exactly), most school districts do not exactly match other geographic boundaries. Some data, such as day care costs, are available by county, while other data, such as water, are mostly available by census designated place. It is our understanding that the 2017 and 2015 studies matched each school district to only one county, city, or ZIP code, and any value associated with that geography was appropriated to the school district completely. In this study, we improved this process by first determining the proportion of households within various geographic combinations, and we used those proportions to allocate values from counties and cities to school districts. This approach is more robust than assuming that school districts do not overlap other geographic boundaries.

- **Applying sales tax.** Similar to the discussion above about accounting for geographic overlap, sales taxes vary notably by geography. For example, St. Vrain School District includes taxing jurisdictions of Longmont, Niwot, unincorporated Boulder County, Fredrick, Firestone, unincorporated Weld County, and parts of the district are within the Regional Transportation District. It is our understanding that the 2017 and 2015 studies assigned sales taxes without accounting for the proportion of businesses or households within each unique taxing jurisdiction. This study, however, does assign every household and business to its unique taxing jurisdiction, so the results represent a more realistic assessment of the cost of living.

- **Standardizing natural gas rates.** It is our understanding that previous cost of living studies measured natural gas costs as natural gas revenue divided by the number of natural gas customers for each utility. While that approach does reflect the amount of money spent on natural gas, it does not appropriately reflect the relative cost per unit of natural gas. Home sizes vary across districts, and larger homes typically use more natural gas for heating. Previous calculations that divided revenue by number of customers were more reflective of the amount of natural gas used

than the cost for natural gas. In this study, we improved this process by calculating the cost per unit of natural gas for each utility, then calculated a standardized natural gas bill based on the benchmark household using 750 Therms of natural gas per year.

- **Applying propane rates to rural households.** Unlike electric utilities, natural gas providers generally do not publicly share their service area boundaries, because the information is proprietary. And unlike access to electric service, which is widespread, access to natural gas service is much more limited to urban areas and corridors between urban areas. Thus, households in rural parts of districts are unlikely to have natural gas access, even if urban parts of that same district do have natural gas access. Previous studies assumed that if natural gas was provided anywhere in the district, then all households in the district had access. In this study, however, we assume that households outside of census designated places do not have natural gas access and therefore rely on propane, which is more likely to accurately reflect the cost of living in rural districts where natural gas is accessible by only a small proportion of households.

APPENDIX C: STATISTICAL MEASURES & TECHNIQUES USED IN THIS REPORT

This appendix is reproduced from previous cost of living reports to ensure that this information on the development of confidence intervals is available to readers each year. Confidence intervals reflect the uncertainty arising from the fact that every store in the state is not visited. The general concept employed in this methodology is the propagation of uncertainty. Uncertainty propagation examines how the uncertainty in a calculated result depends on the uncertainty in the measured values that are entered into the formula. The generalized equation for error propagation for a function *f(x, y, z …)* where variables x, y and z are uncorrelated is:

$$\sigma_f^2 = \left(\frac{\partial f}{\partial x}\right)^2 \sigma_x^2 + \left(\frac{\partial f}{\partial y}\right)^2 \sigma_y^2 + \left(\frac{\partial f}{\partial z}\right)^2 \sigma_z^2 + \ldots \qquad [1]$$

where σ_i^2 is the variance of variable *i*. For this project, we are interested in determining the variances (the 95% confidence interval of f is approximately $1.96\sigma_f$) of the cost of living index $COL = f(\mu_D, S, p, w)$ where μ_D are the mean prices of consumer products in the district, S are the shopping patterns, p are the decimal population fractions in each district, and w are weights that determine the contributions of individual consumer products to the overall cost of living. All four of these variable types are estimated from surveys of one type or another, and hence have error associated with them. However, only the errors in the district consumer prices μ_D are considered in the Bengtsson treatment.

The Bengtsson derivations for the propagation of μ_D errors are approximate in that equation [1] is not applied directly to the *COL* function. Rather, for simplicity, equation [1] is applied successively to components of the *COL* function in order to build up the final expression for σ_f^2. This simplification is probably necessary given the complexity of the *COL* function. An amplification of the derivation of the variances of interest is provided later. The conceptual part of this appendix will address some key questions.

Does a large variance in the item cost data automatically translate to a large confidence interval? Consider that you wanted to get a haircut in Aspen. It is likely that you could find haircuts ranging from around $20 to well over $100, leading to a large variance in the price of haircuts in Aspen. Does this necessarily mean that the cost of living index will have a large confidence error? No, because the confidence interval depends on the *variance of the estimate of the mean price* as opposed to the variance of the sample. But districts with large price variances do require more intensive sampling. Consider a simplified example where there are 20 places to get a haircut in Aspen, and at half of them you can get a $20 haircut and at the other half haircuts cost $100. Let's also assume that by chance whenever we sample haircut prices that we sample equally between the two haircut prices. Table 1 illustrates what happens to the variance and 95% confidence interval of the estimate of the mean price as a function of number of prices sampled.

Variance and Confidence Interval of Mean Price Estimate as a Function of Sample Size				
N	Estimate of Mean Price	Variance of Sample	Variance of Estimate of Mean Price	95% Confidence Interval of Estimate of Mean Price
2	$60	3200	1516	$76
4	$60	2133	449	$42
8	$60	1829	144	$24
16	$60	1797	24	$10

While this example is somewhat extreme, it does illustrate that large variances in the district prices can be overcome by more intensive sampling. However, a question arises; are the higher priced haircuts even pertinent to the middle-income population targeted by the study, given the availability of lower priced haircuts? Seemingly, much of this problem would go away with a combination of strict item criteria and careful outlier detection process. If additional sampling of certain districts is indicated by large CI, more detailed outlier removal for that shopping district may be indicated.

Does a large CI always signal a need for additional price sampling? The primary motivation of determining confidence intervals of COL indices is to determine if additional sampling is needed. The question arises, is additional sampling always in indicated when the CI is large? Probably not. Consider a rural area where there may be one grocery store in which the majority of people shop, but also several small convenience stores with somewhat higher prices. Provided the initial price sampling included the grocery store, additional sampling of convenience stores will likely artificially inflate the mean price. The uncertainty in the size of the shopping universe also complicates this situation (see first paragraph of the appendix). As the number of stores sampled (n) approaches the number of stores in the universe of stores (U), the uncertainty in the mean price estimate approaches zero. So, in a small district with large price variances, the strategy for reducing the CI would be to sample every store. However, in some cases the number of stores sampled to date exceeded the supposed value of U. This uncertainty of U makes it difficult to be certain that every store has been sampled. The need to increase sampling of high CI districts needs to be evaluated on a case by case basis. Most of the challenges described so far could be eliminated with store-specific shopping patterns for the target income group. However, reliable collection of such data is probably impossible.

What are the limitations of the method used to calculate the confidence intervals of the COL indices? One of the major limitations of the method of calculating CI is that only uncertainty in mean district prices is taken into account. There is also likely to be uncertainty in the shopping patterns, which also propagates through the calculation and would affect the uncertainty in the COL indices. There may also be smaller errors associated with the weighting and population factors, depending on what these measures are designed to represent. Mathematically, the derivation of an analytical expression to propagate uncertainty in the district prices, shopping patterns, and other sources of uncertainty may be difficult. A Monte Carlo method may be more practical. However, given the expected size of the uncertainty in the shopping patterns, the overall uncertainty in the COL indices, if additional factors are included, may appear to be unacceptably large without prior education.

Alternatively, a separate CI interval could be calculated using uncertainty of the shopping pattern alone, without consideration of the uncertainty in shopping patterns. The purpose of this CI would be to determine if additional surveying of shopping patterns is needed.

What does the confidence interval actually tell us? The confidence interval as calculated by the Bengtsson method indicates the level of uncertainty in the COL indices as affected by uncertainty in the prices available to consumers. It does not reflect the overall uncertainty in the mean COL estimates. It can be used as a screening tool to identify districts that may potentially benefit from additional price sampling. However, once identified, some additional consideration needs to be given to whether additional price sampling would actually be beneficial or whether tools such as outlier detection may be more appropriate. In general, shopping areas that have a large number of consumer choices and large price variances may benefit from additional sampling. If the shopping district has relatively few choices, additional sampling could help provided 1) the new stores sampled actually capture a significant market share and 2) the total universe of stores in the district is known with certainty.

Statistical Appendix

To illustrate the application of equation 1 to the *COL* function and to aid in decoding the vector notation in the Bengtsson methodology, we will consider a simple case in which there are two school districts and three shopping districts in the state. For each consumer item that contributes to the COL index, we estimate the mean price within the district μ_D by a shopping survey of a subset *n* of the stores. We also calculate the variance of the sample σ_D from the sample data. The *variance of the estimate of* μ_D is given by $\sigma_\mu^2 = \sigma_D^2/n$, which is also the square of the standard error of the sample. As *n* approaches the total number of stores that have that item (*U*), the accuracy of our estimate of μ_D increases. We account for this effect on σ_μ^2 by multiplying by the factor $(U-n)/(U-1)$. So, for our example we have: $\mathbf{\mu_D} = (\mu_{D1}, \mu_{D2}, \mu_{D3})'$ and $\mathbf{\sigma_\mu} = (\sigma_{\mu1}^2, \sigma_{\mu2}^2, \sigma_{\mu3}^2)'$. We also have the shopping pattern matrix (note that the shopping matrix assembled by Corona Insights is actually **S'** as shown below):

$$\mathbf{S}' = \begin{pmatrix} S_{11} & S_{12} & S_{13} \\ S_{21} & S_{22} & S_{23} \end{pmatrix} \qquad [2]$$

The actual prices paid by consumer in the district is the shopping-pattern-weighted costs $\mathbf{\mu_{SD}} = \mathbf{S}'\mathbf{\mu_D}$. If we expand this for school district 1 we get:

$$\mu_{SD1} = S_{11}\mu_{D1} + S_{12}\mu_{D2} + S_{13}\mu_{D3} \qquad [3]$$

If we now apply equation [1] to find $\sigma_{S\mu1}^2$ (the variance of μ_{SD1}):

$$\sigma_{S\mu1}^2 = \left(\frac{\partial \mu_{SD1}}{\partial \mu_{D1}}\right)^2 \sigma_{\mu1}^2 + \left(\frac{\partial \mu_{SD1}}{\partial \mu_{D2}}\right)^2 \sigma_{\mu2}^2 + \left(\frac{\partial \mu_{SD1}}{\partial \mu_{D3}}\right)^2 \sigma_{\mu3}^2 = S_{11}^2\sigma_{\mu1}^2 + S_{12}^2\sigma_{\mu2}^2 + S_{13}^2\sigma_{\mu3}^2$$

This corresponds to the vector notation:

$$\sigma_{S\mu}^2 = S'\sigma_\mu^2 S$$

where σ_μ^2 and $\sigma_{S\mu}^2$ are square matrices with the elements of interest on the diagonals.

The state-average price is given by:

$$\mu_{SS} = p_1(S_{11}\mu_{D1} + S_{12}\mu_{D2} + S_{13}\mu_{D3}) + p_2(S_{21}\mu_{D1} + S_{22}\mu_{D2} + S_{23}\mu_{D3})$$
$$= (p_1S_{11} + p_2S_{21})\mu_{D1} + (p_1S_{12} + p_2S_{22})\mu_{D2} + (p_1S_{13} + p_2S_{23})\mu_{D3}$$

To find the variance of the state-average price we again apply equation [1]:

$$\sigma_{SS}^2 = \left(\frac{\partial \mu_{SS}}{\partial \mu_{D1}}\right)^2 \sigma_{\mu 1}^2 + \left(\frac{\partial \mu_{SS}}{\partial \mu_{D2}}\right)^2 \sigma_{\mu 2}^2 + \left(\frac{\partial \mu_{SS}}{\partial \mu_{D3}}\right)^2 \sigma_{\mu 3}^2$$
$$= (p_1S_{11} + p_2S_{21})^2 \sigma_{\mu 1}^2 + (p_1S_{12} + p_2S_{22})^2 \sigma_{\mu 2}^2 + (p_1S_{13} + p_2S_{23})^2 \sigma_{\mu 3}^2$$

This corresponds to the vector notation:

$\sigma_{SS}^2 = p'S'\sigma_{\mu}^2 Sp$ ← imagine this in bold

The *COL* is a weighted function of the ratios $r_D = \mu_{SD}/\mu_{SS}$. Now for district 1 we calculate the variance σ_{r1}^2 of the ratio $r_{D1} = \mu_{SD1}/\mu_{SS}$ by application of equation [1] again, remembering that the variances of μ_{SD1} and μ_{SS} are $\sigma_{S\mu 1}^2$ and σ_{SS}^2, respectively:

$$\sigma_{r1}^2 = \left(\frac{\partial r_D}{\partial \mu_{SD1}}\right)^2 \sigma_{S\mu 1}^2 + \left(\frac{\partial r_D}{\partial \mu_{SS}}\right)^2 \sigma_{SS}^2$$
$$= \frac{1}{\mu_{SS}^2}\sigma_{S\mu 1}^2 + \frac{\mu_{SD1}^2}{\mu_{SS}^4}\sigma_{SS}^2 = \frac{1}{\mu_{SS}^2}\left(\sigma_{S\mu 1}^2 + r_{D1}^2\sigma_{SS}^2\right)$$

where we assume r_{D1} can be approximated by 1. Finally, the cost of living index over i items is given by:

$$COL = \sum w_i r_{Di}$$

and its variance is given by:

$$\sigma_{COL}^2 = \sum w_i^2 \sigma_{ri}^2$$

APPENDIX D: RAW PRICING DATA FOR SELECTED PURCHASE CATEGORIES

This appendix provides the raw pricing data that underpins the analysis. Readers receiving this report electronically will need to review an accompanying spreadsheet file, due to the volume of data.

APPENDIX E: SHOPPING PATTERNS SURVEY INSTRUMENT

The survey instruments used for the shopping patterns survey are provided on the following pages. This includes the cover letter, the survey used for non-Front Range areas, and one sample of a Front Range survey plus the map provided where respondents answered according to the "zone" they made their purchase within. Envelopes and postcard reminders are not shown.

The online versions of these surveys contained the same questions, but were formatted to take into account online, including mobile phone, usability.

Cover Letter

Used for all surveys

CORONA INSIGHTS

October 18, 2019

Greetings,

Corona Insights, a local Colorado research firm, is conducting a study to understand shopping locations for residents throughout Colorado. Corona Insights has conducted this study multiple times since 2007 and are currently updating figures for 2019, and we could use your help. This information is used to benefit local communities throughout the state.

We're conducting the enclosed short survey to figure out where people shop and ask that you take approximately five minutes to fill it out, then return it to us in the enclosed postage-paid envelope.

Please take this survey at your earliest convenience. By completing this survey, you will have an opportunity to win one of five $50 Visa gift cards. This is our simple way of thanking you for your time and input.

We hope you enjoy completing the questionnaire and look forward to receiving your response.

Sincerely,

Matt Bruce
Director, Corona Insights

If you have trouble with the survey, contact Matt Bruce of Corona Insights at Matt@CoronaInsights.com or 303-894-8246. For the official rules for the Cost of Living $50 Gift Card Sweepstakes, please visit www.CoronaInsights.com/ShoppingRules.

Survey: No Zones

Used for non-Front Range Regions

1. **On this page, please tell us where you or a member of your household <u>usually</u> purchase each item in the list below. Write the name of the city or town where you usually buy that item. If you usually buy the item online, check the box in the online column. Lastly, if you or a member of your household never purchase the item, check the box in the never purchase column.**

	If usually purchase in a city or town… Tell us the name of that City or Town	**If usually purchase online…** Check box	**If never purchase…** Check box
Example 1: you usually buy this item in Greeley	City: Greeley	❑	❑
Example 2: you usually buy this item online	City: _____	☒	❑
Non-perishable groceries such as canned goods	City: _____	❑	❑
Fresh fruits, vegetables, or other produce	City: _____	❑	❑
Perishable groceries such as milk, meat, or ice cream	City: _____	❑	❑
Household products such as laundry soap, batteries, or toothpaste	City: _____	❑	❑
Meal at a restaurant (not pizza)	City: _____		❑
Pizza at/from a restaurant (If you ordered online, list the city or town where the store is located)	City: _____		❑
Alcoholic beverages purchased to drink at home (not a bar or restaurant)	City: _____	❑	❑
Tobacco products	City: _____	❑	❑
Clothes or shoes	City: _____	❑	❑
Gasoline	City: _____		❑
Car maintenance and repair services	City: _____		❑
Movie theater tickets (If you bought your tickets online, list the zone or town where you saw the movie.)	City: _____		❑
Haircut (men's or women's)	City: _____		❑

We'll now ask about less frequent purchases.

2. **Have you, or someone in your household, purchased a small appliance (such as a blender, coffee maker, etc.) in the <u>past 2 years</u>? *Please check one.***

❑ Yes, I bought this item while living in my <u>current</u> region (Please answer 2a)

❑ Yes, but I bought this item while living in <u>different</u> region (Please answer 2b)

❑ No, I have not purchased in the past 2 years (Please answer 2b)

2a. **In what city or town did you make your most recent small appliance (such as a blender, coffee maker, etc.) purchase?**		***2b.*** **If you were going to buy a small appliance, in what city or town do you think you would you do so?**	
Name of City or Town (Please print clearly)	**If purchased online…** Check box	**Name of City or Town** (Please print clearly)	**If purchased online…** Check box
_____	❑	_____	❑

3. **Have you, or someone in your household, purchased a television in the <u>past 2 years</u>? *Please check one.***

❑ Yes, I bought this item while living in my <u>current</u> region (Please answer 3a)

❑ Yes, but I bought this item while living in <u>different</u> region (Please answer 3b)

❑ No, I have not purchased in the past 2 years (Please answer 3b)

3a. **In what city or town did you make your most recent television purchase?**		***3b.*** **If you were going to buy a television, in what city or town do you think you would you do so?**	
Name of City or Town (Please print clearly)	**If purchased online…** Check box	**Name of City or Town** (Please print clearly)	**If purchased online…** Check box
_____	❑	_____	❑

Now we just have a few questions about housing prices and locations.

4. **Which of the following best describes your home?** ***Please check one.***

   - ❑ Single family home, not attached to other units
   - ❑ Part of a 2-, 3-, or 4-unit structure (such as a duplex, triplex, or fourplex)
   - ❑ In a building with 5 to 19 housing units
   - ❑ In a building with 20 or more units
   - ❑ A mobile home
   - ❑ Some other type of housing unit *Please tell us:* [ ]

5. **How many bedrooms are in your home?** ***Please write a number. If it's a studio or buffet unit, write "0".***

   [ ]

6. **Do you rent or own your home?** ***Please check one.***

   - ❑ Own
   - ❑ Rent
   - ❑ Other *Please tell us:* [ ]
   - ❑ Don't Know

7. **How much do you agree or disagree with the following statement: I usually try new products before other people do.**

   - ❑ Strongly Disagree
   - ❑ Disagree
   - ❑ Agree
   - ❑ Strongly Agree

Our last questions are about you and your location, so we can map and analyze the data.

8. **Are you…?**

- ❑ Male
- ❑ Female
- ❑ Prefer to self-describe *Please tell us:* [ ]

9. **In what year were you born?** ***Please enter a 4-digit year.***

[ ]

10. **Please tell us more about your location.**

City (or nearest city): [ ] County: [ ] Zip: [ ]

11. **Which category <u>best</u> describes the occupation(s) of the adults (age 18 and older) in your household?** ***Please select the occupations for all members of your household.***

- ❑ Employed by a for-profit company or business or individual
- ❑ Employed by a not-for-profit, tax-exempt, or charitable organization
- ❑ Government employee (Local, State, or Federal)
- ❑ Military
- ❑ Teacher (K-12)
- ❑ Self-employed
- ❑ Student
- ❑ Retiree
- ❑ Homemaker
- ❑ Other

Thank you. We appreciate your time.

If you would like to enter the sweepstakes for a chance to win one of five $50 Visa Gift Cards, please include your contact information below. Your responses will remain confidential. For the official rules for the Sweepstakes, please visit: CoronaInsights.com/ShoppingRules or contact (303) 894-8246 or Matt@CoronaInsights.com. You do not have to complete a survey to be entered into the Sweepstakes. See the rules for alternate means of entry.

Name: _____

Telephone: _____

Email: _____

Version: #.#####

Survey: With Zones

Denver Region Example

Specific survey used in Denver. Similar survey used in other Front Range regions including: Colorado Springs, Northern Colorado, and the region between Metro Denver and Northern Colorado.

1. **On this page, please tell us where you or a member of your household <u>usually</u> purchase each item in the list below. If you usually buy the item in the Denver Metro area, <u>please use the enclosed maps</u> to find the zone where you usually purchase the item, then write the zone letter below. However, if you usually buy the item outside the Denver Metro area, write the name of the city or town where you usually buy that item. If you usually buy the item online, check the box in the online column. Lastly, if you or a member of your household never purchase the item, check the box in the never purchase column.**

	If usually purchase in Denver Metro Area… Tell us the zone from enclosed map	**If usually purchase elsewhere…** Tell us the name of that City or Town	**If purchase online…** Check box	**If never purchase…** Check box
Example 1: you usually buy this item in Arvada	Zone: Q	City: _____	❑	❑
Example 2: you usually buy this item in Greeley	Zone: _____	City: Greeley	❑	❑
Example 3: you usually buy this item online	Zone: _____	City: _____	☒	❑
Non-perishable groceries such as canned goods	Zone: _____	City: _____	❑	❑
Fresh fruits, vegetables, or other produce	Zone: _____	City: _____	❑	❑
Perishable groceries such as milk, meat, or ice cream	Zone: _____	City: _____	❑	❑
Household products such as laundry soap, batteries, or toothpaste	Zone: _____	City: _____	❑	❑
Meal at a restaurant (not pizza)	Zone: _____	City: _____		❑
Pizza at/from a restaurant (If you ordered online, list the city or town where the store is located)	Zone: _____	City: _____		❑
Alcoholic beverages purchased to drink at home (not a bar or restaurant)	Zone: _____	City: _____	❑	❑
Tobacco products	Zone: _____	City: _____	❑	❑
Clothes or shoes	Zone: _____	City: _____	❑	❑
Gasoline	Zone: _____	City: _____		❑
Car maintenance and repair services	Zone: _____	City: _____		❑
Movie theater tickets (If you bought your tickets online, list the zone or town where you saw the movie.)	Zone: _____	City: _____		❑
Haircut (men's or women's)	Zone: _____	City: _____		❑

We'll now ask about less frequent purchases. Again, if you or someone in your household bought the item in the Denver Metro area, please use the enclosed map to indicate in which zone you purchased the item.

2. **Have you, or someone in your household, purchased a small appliance (such as a blender, coffee maker, etc.) in the past 2 years? *Please check one.***

❑ Yes, I bought this item while living in my current region (Please answer 2a)

❑ Yes, but I bought this item while living in different region (Please answer 2b)

❑ No, I have not purchased in the past 2 years (Please answer 2b)

2a. **In what city or town did you make your most recent small appliance (such as a blender, coffee maker, etc.) purchase?**			***2b.*** **If you were going to buy a small appliance, in what city or town do you think you would you do so?**		
If purchased in the Denver Metro Area… Tell us the zone from enclosed map Zone: ____	**If purchased elsewhere…** Tell us the name of that City or Town _____	**If purchased online…** Check box ❑	**If in the Denver Metro Area…** Tell us the zone from enclosed map Zone: ____	**If elsewhere…** Tell us the name of that City or Town _____	**If online…** Check box ❑

3. **Have you, or someone in your household, purchased a television in the past 2 years? *Please check one.***

❑ Yes, I bought this item while living in my current region (Please answer 3a)

❑ Yes, but I bought this item while living in different region (Please answer 3b)

❑ No, I have not purchased in the past 2 years (Please answer 3b)

3a. **In what city or town did you make your most recent television purchase?**			***3b.*** **If you were going to buy a television, in what city or town do you think you would you do so?**		
If purchased in the Denver Metro Area… Tell us the zone from enclosed map Zone: ____	**If purchased elsewhere…** Tell us the name of that City or Town _____	**If purchased online…** Check box ❑	**If in the Denver Metro Area…** Tell us the zone from enclosed map Zone: ____	**If elsewhere…** Tell us the name of that City or Town _____	**If online…** Check box ❑

Now we just have a few questions about housing prices and locations.

4. **Which of the following best describes your home?** ***Please check one.***

   - ❑ Single family home, not attached to other units
   - ❑ Part of a 2-, 3-, or 4-unit structure (such as a duplex, triplex, or fourplex)
   - ❑ In a building with 5 to 19 housing units
   - ❑ In a building with 20 or more units
   - ❑ A mobile home
   - ❑ Some other type of housing unit *Please tell us:* [ ]

5. **How many bedrooms are in your home?** ***Please write a number. If it's a studio or buffet unit, write "0".***

   [ ]

6. **Do you rent or own your home?** ***Please check one.***

   - ❑ Own
   - ❑ Rent
   - ❑ Other *Please tell us:* [ ]
   - ❑ Don't Know

7. **How much do you agree or disagree with the following statement: I usually try new products before other people do.**

   - ❑ Strongly Disagree
   - ❑ Disagree
   - ❑ Agree
   - ❑ Strongly Agree

Our last questions are about you and your location, so we can map and analyze the data.

8. **Are you…?**

- ❑ Male
- ❑ Female
- ❑ Prefer to self-describe *Please tell us:* ____

9. **In what year were you born?** ***Please enter a 4-digit year.***

____

10. **Please tell us more about your location.**

City (or nearest city): ____ County: ____ Zip: ____

11. **Which category <u>best</u> describes the occupation(s) of the adults (age 18 and older) in your household?** ***Please select the occupations for all members of your household.***

- ❑ Employed by a for-profit company or business or individual
- ❑ Employed by a not-for-profit, tax-exempt, or charitable organization
- ❑ Government employee (Local, State, or Federal)
- ❑ Military
- ❑ Teacher (K-12)
- ❑ Self-employed
- ❑ Student
- ❑ Retiree
- ❑ Homemaker
- ❑ Other

Thank you. We appreciate your time.

If you would like to enter the sweepstakes for a chance to win one of five $50 Visa Gift Cards, please include your contact information below. Your responses will remain confidential. For the official rules for the Sweepstakes, please visit: CoronaInsights.com/ShoppingRules or contact (303) 894-8246 or Matt@CoronaInsights.com. You do not have to complete a survey to be entered into the Sweepstakes. See the rules for alternate means of entry.

Name: _____

Telephone: _____

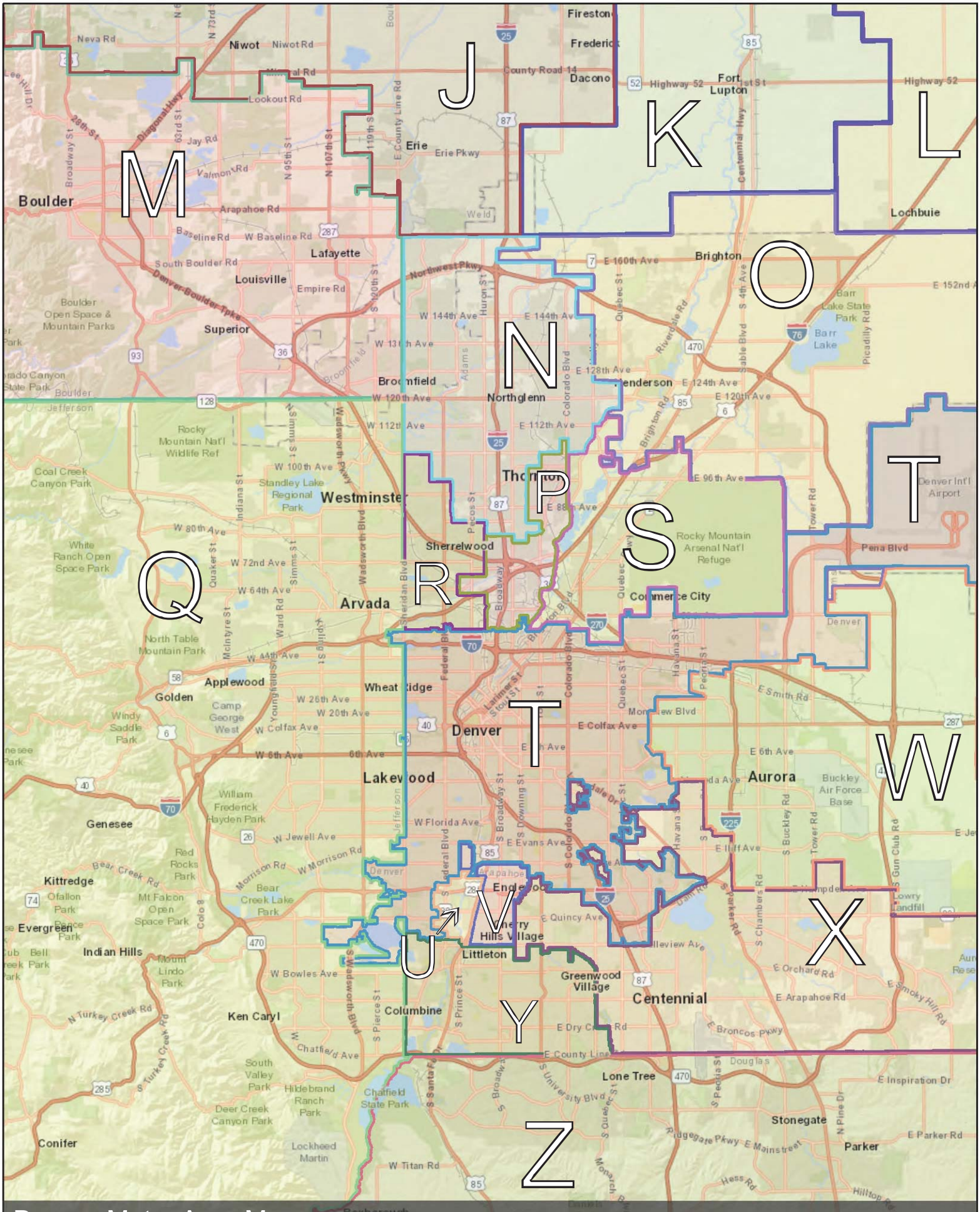
Email: _____

Version: #.#####

Map

Denver Region Example

Specific map used in Denver. Similar maps were produced for each area that received a survey with zones.



Denver Metro Area Map.

The shaded areas and letters each represent a "zone" that you can use in the survey.

APPENDIX F: SHOPPING PATTERNS MATRICES

This appendix provides the geographic shopping patterns matrix used in this analysis. The matrix is based on a survey of Colorado residents conducted in the fall of 2019. Data from this survey, in conjunction with mathematical modeling methods, were used to construct a geographic shopping matrix describing where the residents of each school district typically purchase particular products (i.e., what proportion of purchases are made in the home district, in each neighboring district, online, etc.). Readers of this report will need to review an accompanying spreadsheet file due to the volume of data.