CORONA INSIGHTS
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2011 Colorado School District Cost of Living Study
Colorado Legislative Council

CONTENTS

2011 COLORADO SCHOOL DISTRICT COST OF LIVING STUDY

CONDUCTED FOR THE COLORADO LEGISLATIVE COUNCIL

SECTION 1: INTRODUCTION

Corona Insights is pleased to present this report to the Colorado Legislative Council. The following report provides the 2011 cost of living index for each of Colorado's 178 school districts, along with a description of the project design and research methodology.

BACKGROUND

In July of 2011, Corona Insights was retained to conduct the 2011 Colorado School District Cost of Living Study for the Colorado Legislative Council. This study measures the differences in the cost to purchase a typical "market basket" of goods among the 178 public school districts in the State of Colorado. Final cost of living factors detailed within this study reflect the relative cost differences for all notable site-specific living expenses (i.e., housing, transportation, goods, services and taxes) among Colorado's school districts. The cost of living index developed herein is used as one component of each district's per pupil funding formula.

This report is the latest in a series of biennial reports that were first conducted as a result of the Public School Finance Act of 1994.

SECTION 2: GENERAL OVERVIEW OF RESEARCH DESIGN

The goal of the project is to develop comparative cost of living figures for each of the 178 school districts in the state. To do that requires answering five major questions:

1. What is a "typical" (archetypal) Colorado household in terms of size and income?
2. What types of goods and services does that archetypal household buy?
3. Where do they buy those goods and services?
4. How much do those goods and services cost in differing geographic locations?
5. If an archetypal household lives in each of the 178 school districts, what is the difference between their costs to buy those goods, based on the prices where they shop?

The research process sought to answer each of these questions.

As a structure for this approach, the cost of living estimates are based on the following global assumptions:

RESEARCH STRUCTURE

⇨ We begin with an archetypal household of three people with a total household income of $49,200, which is the average teacher income for 2010 in Colorado;

⇨ Then we place that household in each school district in Colorado;

⇨ That household then spends their income on the same suite of goods and services that are purchased by the average household of that size and income level throughout the United States;

⇨ The archetypal household then shops inside and outside their district in a pattern that emulates the geographic shopping patterns of all households in that district;

⇨ The price for goods and services in each district where they shop may differ, even if the good or service is identical, based on market factors;

⇨ Final Cost of Living findings are then calculated. These final findings detail the differences in costs of living for the archetypal household in each district to purchase a standard suite of goods and services.

An overview of the methodology is provided in Section 4 of this report, with additional detail provided in Appendix B. Appendix C denotes notable methodological changes between the 2009 study and the 2011 study.

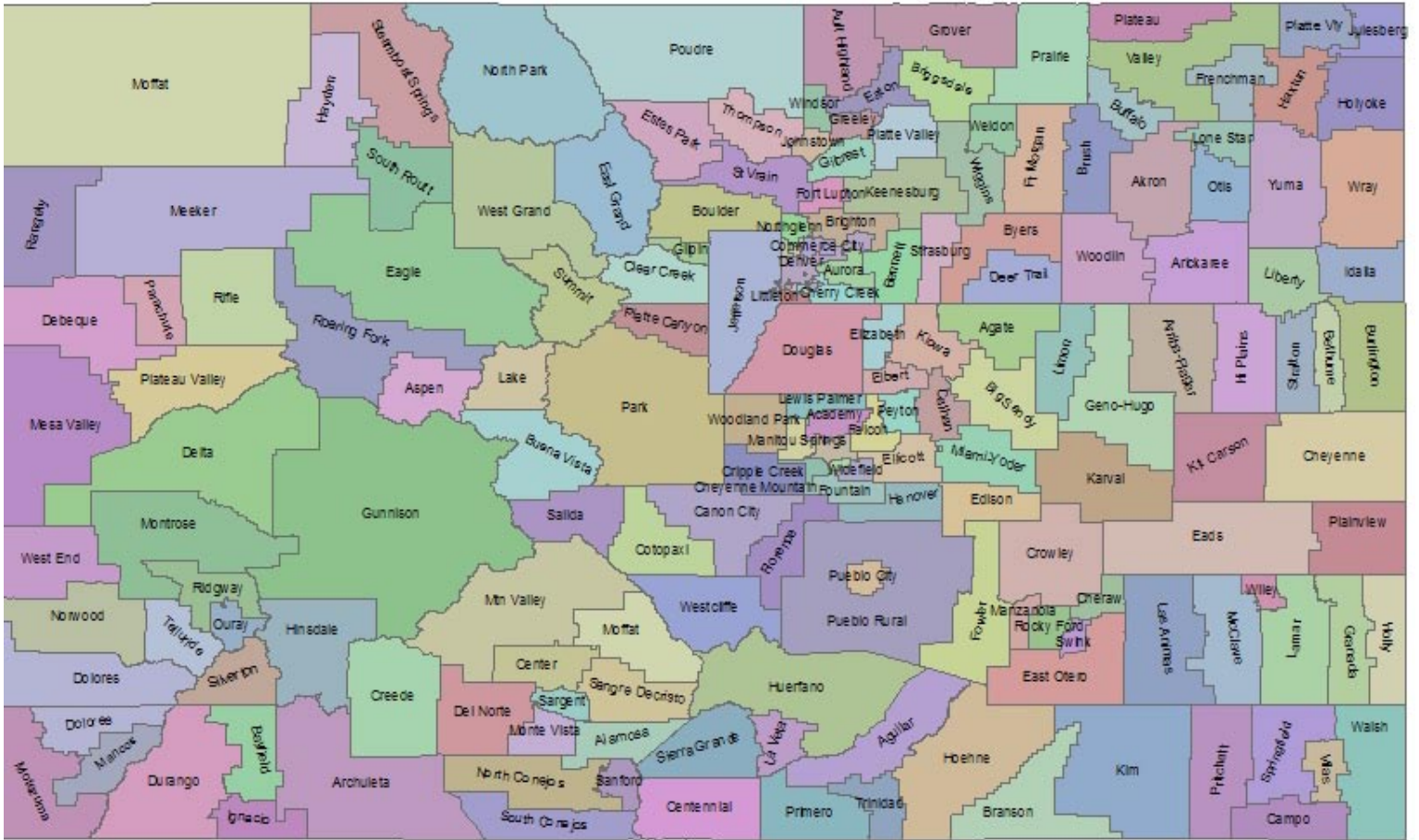# SECTION 3: 2011 COLORADO SCHOOL DISTRICT COST OF LIVING FINDINGS

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 2011. Figures are reported in order by District number (and alphabetically by County name), along with appropriate 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 archetypal household. (See Section 4 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. Once again, Aspen has the highest cost of living, however it is somewhat less extreme in 2011 than it was in 2009, largely because of declines in the housing market. Other mountain districts make up the top of the list, including Telluride, Summit County, Steamboat Springs, and Eagle County districts. Boulder moved into the top 10 for 2011, up from #11 in 2009. The districts with the lowest cost of living are primarily located in the southeastern corner of the state.

Below, a map detailing the location of each of the 178 school districts is provided for the reader's convenience. An easy to read electronic map of all Colorado School Districts can also be found at: http://www.cde.state.co.us/cdereval/download/PDF/Maps/map-district.pdf

EXHIBIT 3-1: MAP OF COLORADO SCHOOL DISTRICTS, 2011
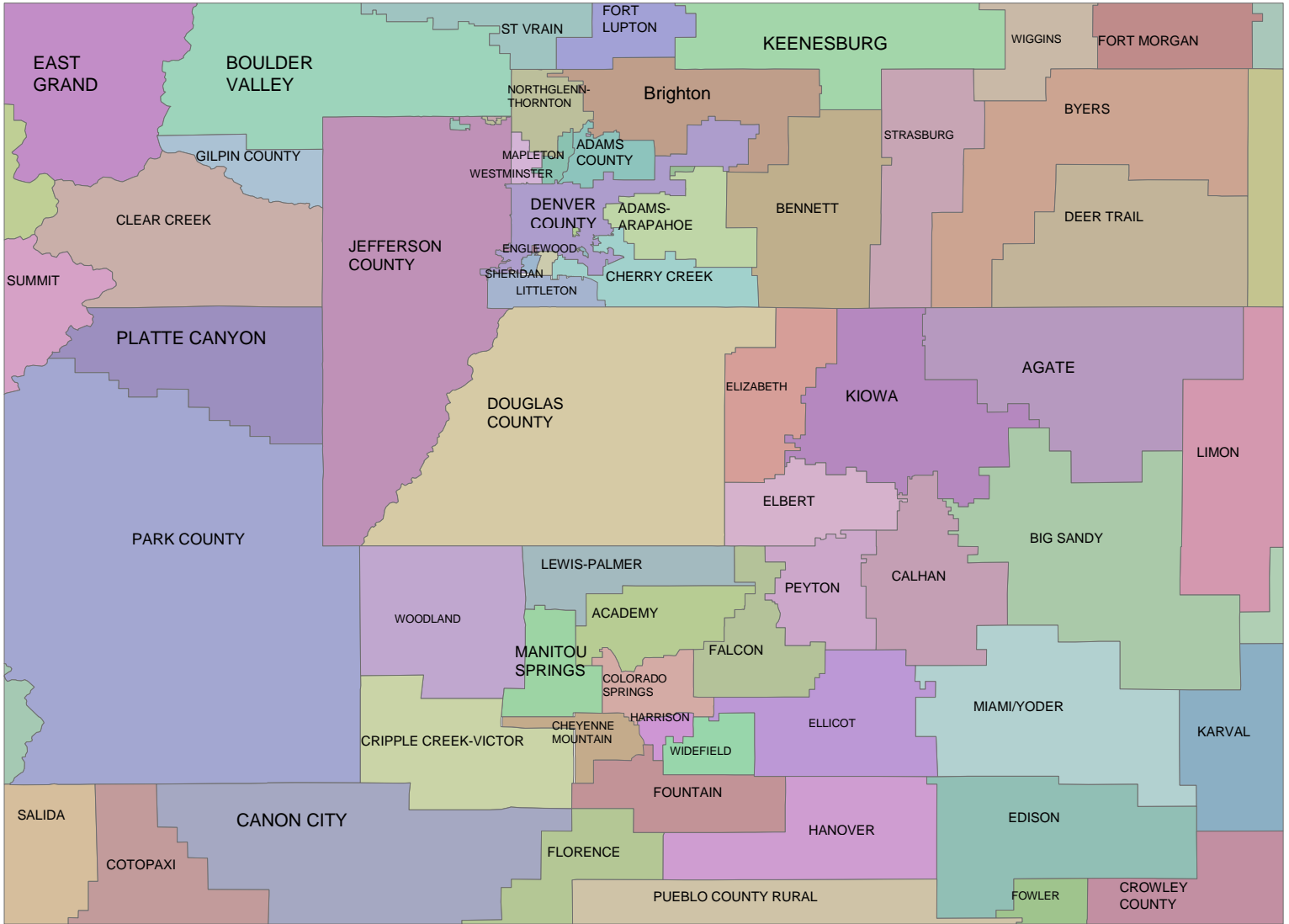
EXHIBIT 3-3: COST OF LIVING BY SCHOOL DISTRICT, 2011

District ID	County	District	Total	Index	Rank
		State	$49,200	100	
10	Adams	MAPLETON 1	$46,866	95.3	89
20	Adams	ADAMS 12 FIVE STAR SCHOOLS	$48,830	99.2	49
30	Adams	ADAMS COUNTY 14	$45,041	91.5	116
40	Adams	BRIGHTON 27J	$48,123	97.8	63
50	Adams	BENNETT 29J	$47,908	97.4	66
60	Adams	STRASBURG 31J	$48,540	98.7	52
70	Adams	WESTMINSTER 50	$47,608	96.8	73
100	Alamosa	ALAMOSA RE-11J	$44,803	91.1	121
110	Alamosa	SANGRE DE CRISTO RE-22J	$44,564	90.6	127
120	Arapahoe	ENGLEWOOD 1	$49,581	100.8	39
123	Arapahoe	SHERIDAN 2	$48,500	98.6	54
130	Arapahoe	CHERRY CREEK 5	$49,464	100.5	41
140	Arapahoe	LITTLETON 6	$50,626	102.9	30
170	Arapahoe	DEER TRAIL 26J	$45,605	92.7	107
180	Arapahoe	ADAMS-ARAPAHOE 28J	$47,290	96.1	75
190	Arapahoe	BYERS 32J	$46,180	93.9	99
220	Archuleta	ARCHULETA COUNTY 50 JT	$47,678	96.9	69
230	Baca	WALSH RE-1	$41,677	84.7	166
240	Baca	PRITCHETT RE-3	$40,554	82.4	177
250	Baca	SPRINGFIELD RE-4	$41,948	85.3	162
260	Baca	VILAS RE-5	$41,135	83.6	174
270	Baca	CAMPO RE-6	$40,972	83.3	175
290	Bent	LAS ANIMAS RE-1	$41,482	84.3	168
310	Bent	MC CLAVE RE-2	$42,155	85.7	158
470	Boulder	ST VRAIN VALLEY RE 1J	$49,070	99.7	45
480	Boulder	BOULDER VALLEY RE 2	$55,331	112.5	8
490	Chaffee	BUENA VISTA R-31	$48,208	98.0	60
500	Chaffee	SALIDA R-32	$48,665	98.9	50
510	Cheyenne	KIT CARSON R-1	$42,265	85.9	154
520	Cheyenne	CHEYENNE COUNTY RE-5	$42,635	86.7	148
540	Clear Creek	CLEAR CREEK RE-1	$52,533	106.8	18
550	Conejos	NORTH CONEJOS RE-1J	$41,937	85.2	163
560	Conejos	SANFORD 6J	$42,132	85.6	159
580	Conejos	SOUTH CONEJOS RE-10	$42,542	86.5	150

Note. The rank value orders the districts from the most expensive (#1) to the least expensive (#178). 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.

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EXHIBIT 3-3: COST OF LIVING BY SCHOOL DISTRICT, 2011 (CONT'D)

District ID	County	District	Total	Index	Rank
		State	$49,200	100	
640	Costilla	CENTENNIAL R-1	$42,784	87.0	147
740	Costilla	SIERRA GRANDE R-30	$44,841	91.1	119
770	Crowley	CROWLEY COUNTY RE-1-J	$41,263	83.9	172
860	Custer	CUSTER COUNTY SCHOOL DISTRICT C-1	$48,328	98.2	58
870	Delta	DELTA COUNTY 50(J)	$47,978	97.5	65
880	Denver	DENVER COUNTY 1	$50,112	101.9	33
890	Dolores	DOLORES COUNTY RE NO.2	$44,919	91.3	118
900	Douglas	DOUGLAS COUNTY RE 1	$50,297	102.2	32
910	Eagle	EAGLE COUNTY RE 50	$58,156	118.2	5
920	Elbert	ELIZABETH C-1	$52,114	105.9	22
930	Elbert	KIOWA C-2	$49,683	101.0	36
940	Elbert	BIG SANDY 100J	$44,198	89.8	131
950	Elbert	ELBERT 200	$51,416	104.5	25
960	Elbert	AGATE 300	$47,148	95.8	79
970	El Paso	CALHAN RJ-1	$46,058	93.6	101
980	El Paso	HARRISON 2	$46,871	95.3	88
990	El Paso	WIDEFIELD 3	$47,678	96.9	70
1000	El Paso	FOUNTAIN 8	$46,536	94.6	93
1010	El Paso	COLORADO SPRINGS 11	$47,090	95.7	81
1020	El Paso	CHEYENNE MOUNTAIN 12	$52,325	106.4	20
1030	El Paso	MANITOU SPRINGS 14	$52,072	105.8	23
1040	El Paso	ACADEMY 20	$49,342	100.3	42
1050	El Paso	ELLICOTT 22	$45,432	92.3	111
1060	El Paso	PEYTON 23 JT	$47,636	96.8	72
1070	El Paso	HANOVER 28	$47,264	96.1	76
1080	El Paso	LEWIS-PALMER 38	$50,850	103.4	29
1110	El Paso	FALCON 49	$49,010	99.6	46
1120	El Paso	EDISON 54 JT	$47,199	95.9	77
1130	El Paso	MIAMI/YODER 60 JT	$45,258	92.0	113
1140	Fremont	CANON CITY RE-1	$45,614	92.7	106
1150	Fremont	FLORENCE RE-2	$47,796	97.1	67
1160	Fremont	COTOPAXI RE-3	$46,538	94.6	92
1180	Garfield	ROARING FORK RE-1	$57,799	117.5	6
1195	Garfield	GARFIELD RE-2	$51,023	103.7	27
1220	Garfield	GARFIELD 16	$48,920	99.4	48
1330	Gilpin	GILPIN COUNTY RE-1	$49,931	101.5	34

EXHIBIT 3-3: COST OF LIVING BY SCHOOL DISTRICT, 2011 (CONT'D)

District ID	County	District	Total	Index	Rank
		State	$49,200	100	
1340	Grand	WEST GRAND 1-JT.	$49,796	101.2	35
1350	Grand	EAST GRAND 2	$55,909	113.6	7
1360	Gunnison	GUNNISON WATERSHED RE1J	$52,790	107.3	16
1380	Hinsdale	HINSDALE COUNTY RE 1	$54,314	110.4	9
1390	Huerfano	HUERFANO RE-1	$43,259	87.9	143
1400	Huerfano	LA VETA RE-2	$46,836	95.2	90
1410	Jackson	NORTH PARK R-1	$45,769	93.0	104
1420	Jefferson	JEFFERSON COUNTY R-1	$49,313	100.2	43
1430	Kiowa	EADS RE-1	$41,717	84.8	165
1440	Kiowa	PLAINVIEW RE-2	$41,391	84.1	169
1450	Kit Carson	ARRIBA-FLAGLER C-20	$44,803	91.1	120
1460	Kit Carson	HI-PLAINS R-23	$44,769	91.0	123
1480	Kit Carson	STRATTON R-4	$45,184	91.8	115
1490	Kit Carson	BETHUNE R-5	$45,577	92.6	108
1500	Kit Carson	BURLINGTON RE-6J	$47,660	96.9	71
1510	Lake	LAKE COUNTY R-1	$52,551	106.8	17
1520	La Plata	DURANGO 9-R	$54,112	110.0	10
1530	La Plata	BAYFIELD 10 JT-R	$51,039	103.7	26
1540	La Plata	IGNACIO 11 JT	$49,590	100.8	38
1550	Larimer	POUDRE R-1	$46,970	95.5	86
1560	Larimer	THOMPSON R-2J	$47,031	95.6	84
1570	Larimer	PARK (ESTES PARK) R-3	$54,018	109.8	11
1580	Las Animas	TRINIDAD 1	$44,767	91.0	124
1590	Las Animas	PRIMERO REORGANIZED 2	$43,886	89.2	136
1600	Las Animas	HOEHNE REORGANIZED 3	$45,223	91.9	114
1620	Las Animas	AGUILAR REORGANIZED 6	$43,350	88.1	142
1750	Las Animas	BRANSON REORGANIZED 82	$41,366	84.1	170
1760	Las Animas	KIM REORGANIZED 88	$41,874	85.1	164
1780	Lincoln	GENOA-HUGO C113	$43,977	89.4	134
1790	Lincoln	LIMON RE-4J	$45,464	92.4	110
1810	Lincoln	KARVAL RE-23	$42,054	85.5	160
1828	Logan	VALLEY RE-1	$45,972	93.4	102
1850	Logan	FRENCHMAN RE-3	$42,968	87.3	146
1860	Logan	BUFFALO RE-4J	$44,010	89.5	133
1870	Logan	PLATEAU RE-5	$43,163	87.7	145

EXHIBIT 3-3: COST OF LIVING BY SCHOOL DISTRICT, 2011 (CONT'D)

District ID	County	District	Total	Index	Rank
		State	$49,200	100	
1980	Mesa	DE BEQUE 49JT	$46,312	94.1	98
1990	Mesa	PLATEAU VALLEY 50	$48,995	99.6	47
2000	Mesa	MESA COUNTY VALLEY 51	$47,008	95.5	85
2010	Mineral	CREEDE SCHOOL DISTRICT	$49,491	100.6	40
2020	Moffat	MOFFAT COUNTY RE:NO 1	$49,306	100.2	44
2035	Montezuma	MONTEZUMA-CORTEZ RE-1	$47,053	95.6	82
2055	Montezuma	DOLORES RE-4A	$48,490	98.6	55
2070	Montezuma	MANCOS RE-6	$49,636	100.9	37
2180	Montrose	MONTROSE COUNTY RE-1J	$48,158	97.9	62
2190	Montrose	WEST END RE-2	$47,766	97.1	68
2395	Morgan	BRUSH RE-2(J)	$48,217	98.0	59
2405	Morgan	FORT MORGAN RE-3	$47,392	96.3	74
2505	Morgan	WELDON VALLEY RE-20(J)	$47,109	95.8	80
2515	Morgan	WIGGINS RE-50(J)	$48,453	98.5	56
2520	Otero	EAST OTERO R-1	$42,225	85.8	156
2530	Otero	ROCKY FORD R-2	$42,003	85.4	161
2535	Otero	MANZANOLA 3J	$40,541	82.4	178
2540	Otero	FOWLER R-4J	$42,391	86.2	153
2560	Otero	CHERAW 31	$40,857	83.0	176
2570	Otero	SWINK 33	$42,610	86.6	149
2580	Ouray	OURAY R-1	$53,313	108.4	14
2590	Ouray	RIDGWAY R-2	$53,638	109.0	12
2600	Park	PLATTE CANYON 1	$50,961	103.6	28
2610	Park	PARK COUNTY RE-2	$52,293	106.3	21
2620	Phillips	HOLYOKE RE-1J	$44,596	90.6	126
2630	Phillips	HAXTUN RE-2J	$43,423	88.3	140
2640	Pitkin	ASPEN 1	$104,361	212.1	1
2650	Prowers	GRANADA RE-1	$41,555	84.5	167
2660	Prowers	LAMAR RE-2	$43,892	89.2	135
2670	Prowers	HOLLY RE-3	$41,291	83.9	171
2680	Prowers	WILEY RE-13 JT	$42,498	86.4	152
2690	Pueblo	PUEBLO CITY 60	$45,857	93.2	103
2700	Pueblo	PUEBLO COUNTY 70	$47,052	95.6	83
2710	Rio Blanco	MEEKER RE1	$50,588	102.8	31
2720	Rio Blanco	RANGELY RE-4	$48,108	97.8	64

EXHIBIT 3-3: COST OF LIVING BY SCHOOL DISTRICT, 2011 (CONT'D)

District ID	County	District	Total	Index	Rank
		State	$49,200	100	
2730	Rio Grande	DEL NORTE C-7	$46,384	94.3	97
2740	Rio Grande	MONTE VISTA C-8	$45,535	92.6	109
2750	Rio Grande	SARGENT RE-33J	$44,317	90.1	129
2760	Routt	HAYDEN RE-1	$53,240	108.2	15
2770	Routt	STEAMBOAT SPRINGS RE-2	$62,263	126.6	4
2780	Routt	SOUTH ROUTT RE 3	$52,446	106.6	19
2790	Saguache	MOUNTAIN VALLEY RE 1	$43,354	88.1	141
2800	Saguache	MOFFAT 2	$46,388	94.3	96
2810	Saguache	CENTER 26 JT	$42,210	85.8	157
2820	San Juan	SILVERTON 1	$53,480	108.7	13
2830	San Miguel	TELLURIDE R-1	$74,912	152.3	2
2840	San Miguel	NORWOOD R-2J	$51,427	104.5	24
2862	Sedgwick	JULESBURG RE-1	$44,536	90.5	128
2865	Sedgwick	PLATTE VALLEY RE-3	$42,537	86.5	151
3000	Summit	SUMMIT RE-1	$63,015	128.1	3
3010	Teller	CRIPPLE CREEK-VICTOR RE-1	$45,396	92.3	112
3020	Teller	WOODLAND PARK RE-2	$48,338	98.2	57
3030	Washington	AKRON R-1	$43,705	88.8	137
3040	Washington	ARICKAREE R-2	$45,037	91.5	117
3050	Washington	OTIS R-3	$44,287	90.0	130
3060	Washington	LONE STAR 101	$44,181	89.8	132
3070	Washington	WOODLIN R-104	$44,799	91.1	122
3080	Weld	WELD COUNTY RE-1	$46,509	94.5	95
3085	Weld	EATON RE-2	$48,524	98.6	53
3090	Weld	KEENESBURG RE-3(J)	$47,167	95.9	78
3100	Weld	WINDSOR RE-4	$48,663	98.9	51
3110	Weld	JOHNSTOWN-MILLIKEN RE-5J	$48,160	97.9	61
3120	Weld	GREELEY 6	$46,765	95.1	91
3130	Weld	PLATTE VALLEY RE-7	$46,101	93.7	100
3140	Weld	WELD COUNTY S/D RE-8	$46,511	94.5	94
3145	Weld	AULT-HIGHLAND RE-9	$45,699	92.9	105
3146	Weld	BRIGGSDALE RE-10	$43,665	88.7	138
3147	Weld	PRAIRIE RE-11	$42,241	85.9	155
3148	Weld	PAWNEE RE-12	$41,244	83.8	173
3200	Yuma	YUMA 1	$46,914	95.4	87
3210	Yuma	WRAY RD-2	$44,641	90.7	125
3220	Yuma	IDALIA RJ-3	$43,509	88.4	139
3230	Yuma	LIBERTY J-4	$43,186	87.8	144

SECTION 4: PROJECT METHODOLOGY

As described in Section 2, the project was structured upon addressing and linking five distinct research questions. These research questions included:

1. What is a "typical" (archetypal, or "benchmark") Colorado household?

   (See "Identifying the Benchmark Household" in this section)

2. What types of goods and services does that archetypal household buy?

   (See "Identifying the Market Basket of Goods and Services" in this section)

3. Where do they buy those goods and services?

   (See "Identifying and Measuring Geographic Shopping Patterns" in this section)

4. How much do those goods and services cost in each geographic location?

   (See "Data Collection" in this section)

5. If an archetypal household lives in each of the 178 school districts, what is the difference between their costs to buy those goods, based on the prices where they shop?

   (See "Developing Final Cost of Living Measures" in this section)

Corona's methodological approach to answering each of these research questions is presented in this section of the report. Appendix B provides additional detail for each methodological section of the study for interested readers.

IDENTIFYING THE "BENCHMARK" HOUSEHOLD

The characteristics of the 2011 benchmark household mirrored the benchmark households used in the previous Colorado School District Cost of Living studies. The benchmark household used in past studies has typically been a household of average size for the state, with an income related to typical teaching incomes. The 2011 benchmark household was defined by the Colorado Legislative Council to be a three-person household with a total household income of $49,200, which is the average teacher income for 2010 in Colorado.

Over the past studies, the household size has remained constant, and the household income has increased at a moderate rate. The exhibit provided below details the current and previous benchmark households used for the study:

EXHIBIT 4-1: DEFINITION OF THE ARCHETYPAL HOUSEHOLD

Year	Size of the Benchmark Household	Household Income of Benchmark Household
2011 (Current Study)	**3 people**	**$49,200**
2009 Study	3 people	$47,500
2007 Study	3 people	$44,500
2005 Study	3 people	$43,000
2003 Study	3 people	$40,000

IDENTIFYING THE "MARKET BASKET" OF GOODS AND SERVICES

> **Methodology at a Glance**
>
> **Goal: Develop a list of specific goods and services that collectively serve as a proxy for all spending by the archetype household.**
>
> 1. *The Bureau of Labor Statistics compiles annual data on consumer spending habits through Consumer Expenditures Surveys.*
>
> 2. *Corona Insights examined the most recent Consumer Expenditure Survey Data (2009 - 2010) to identify major categories of spending (housing, food at home, etc.) for a three person household with the target income level. A total of 18 categories were defined.*
>
> 3. *Corona Insights and the Colorado Legislative Council jointly identified a "market basket" of individual items that represent each major category of spending. For example, a variety of goods such as milk, bread, and other foods were identified to represent grocery expenditures.*
>
> 4. *All items that were selected to be included in the "market basket" were identified with as much specificity as possible in terms of size and quality, so that directly comparable data could be gathered in every school district where that item was sold.*
>
> 5. *Some items, such as energy costs, are monopolistic goods or services. These items were merely measured on a per-unit cost in each district.*
>
> 6. *The market basket was designed to be consistent with the 2009 study where possible and appropriate. In fact, only three notable items were changed from 2009: a television replaced a DVD player, home maintenance costs were dropped from the market basket because no current available data source was identified, and a refrigerator was priced in addition to a mattress. Minor changes in the quantities of goods that were selected were also made to the "market basket", to enhance the comparativeness of goods across all districts. See **Appendix C** for more detail.*
>
> 7. *The average expenditures per major category were calculated and set aside for the final calculations, as the collected data was weighted in proportion to those average expenditures.*

The goal of this step of the process is to develop a list of goods and services that, in combination, can represent the full range of purchases for the archetypal household. The primary data source for this type of analysis is Consumer Expenditure Surveys (CES) that are compiled by the Bureau of Labor Statistics. Data was used from the 2009-2010 Consumer Expenditure Survey, which was the most recently published CES available at the time of analysis.

Data in the Consumer Expenditure Surveys are available by household size and year. Corona used the data for three-person households, and interpolated between the results for three-person household incomes of $40,000 to $49,999 and three-person household incomes of $50,000 to $69,999 (from CES Table 38) to estimate expenditures for a household with an income of $49,200.

Two key types of data are produced from this analysis: 1) a set of categories that reflect major types of expenditures and 2) average spending levels for the archetypal household within each of those categories. That data is shown in the following exhibit. Also shown in the exhibit are individual items that were selected jointly by the Corona Insights team and the Colorado Legislative Council as being representative of each major expenditure category. Prices gathered for these items (with statistical weightings to ensure that their

pricing matches total spending) formed the basis of 2010 Cost of Living estimates.

EXHIBIT 4-2: SPENDING PATTERNS OF THE ARCHETYPAL HOUSEHOLD

Consumer Expenditure Survey Categories and Specific Weights Utilized in Cost of Living Index (Weight as a percentage of income)		
Expenditure Category	**% of Income**	**Representative Market Basket Items**
Food	**15.00%**	
Food at home	9.82%	
Cereals and bakery products	1.31%	White Bread, Spaghetti
Meats, poultry, fish, and eggs	2.41%	
Beef	1.44%	Ground Beef
Poultry	0.97%	Whole Fryer Chicken
Dairy products	1.03%	Milk
Fruits and vegetables	1.68%	
Fresh fruits	0.57%	Bananas
Fresh vegetables	0.51%	Potatoes
Processed fruits	0.29%	Canned Peaches
Processed vegetables	0.32%	Canned Green Beans
Other food at home	3.40%	Coffee, Soup, Frozen Waffles
Food away from home	5.18%	Cheeseburger Meal, Cheese Pizza Meal, NY Strip Steak Meal
Alcoholic beverages	**0.66%**	Beer
Housing	**35.73%**	
Mortgage interest and charges	15.47%	Mortgage Payment
Property taxes	2.93%	Property Taxes
Maintenance, repairs, insurance, other expenses	1.83%	Homeowner's Insurance
Utilities, fuels, and public services	9.05%	
Natural gas	1.24%	Natural Gas
Electricity	3.66%	Electric
Telephone services	3.10%	Telephone
Water and other public services	1.04%	Water & Sewer
Household operations	1.89%	Day Care Services
Housekeeping supplies	1.51%	Laundry Soap
Household furnishings and equipment	3.06%	Refrigerator

Consumer Expenditure Survey Categories and Specific Weights Utilized in Cost of Living Index (Weight as a percentage of income)		
Expenditure Category	**% of Income**	**Representative Market Basket Items**
Apparel and services	**4.00%**	
Men and boys	0.98%	Men's Dress Shirt, Men's T-Shirt
Women and girls	1.93%	Women's Polo Shirt, Women's Pantyhose
Footwear	1.09%	Men's Canvas Lace-up Shoes
Transportation	**15.92%**	
Vehicle purchases (net outlay)	5.18%	Car Payment / Auto Financing
Gasoline and motor oil	6.20%	Gasoline: 85 Unleaded
Other vehicle expenses	5.36%	
Vehicle finance charges	0.83%	Interest Rate, Bank Financing Fees
Maintenance and repairs	1.62%	Oil Change, Front End Alignment
Vehicle insurance	2.92%	Insurance Premiums
Healthcare	**5.93%**	Health Insurance Premium
Entertainment	**4.58%**	
Fees and admissions	0.68%	Movie Ticket (First Run, Full Length Film)
Audio and visual equipment and services	2.06%	Television
Pets, toys, hobbies, and playground equipment	1.25%	Pet Food
Other entertainment supplies, equipment, and services	0.60%	AA Batteries
Personal care products and services	**1.37%**	Women's Haircut, Men's Haircut, Toothpaste, Tampons, Shaving Cream
Reading	**0.18%**	
Education	**1.44%**	
Tobacco products and smoking supplies	**1.23%**	Cigarettes
Miscellaneous	**1.79%**	
Cash contributions	**2.31%**	
Personal insurance and pensions	**9.11%**	
Personal taxes (not including stimulus)	**0.76%**	Income Tax with Itemized Deductions for Mortgage Interest
Total (bold level)	*100.00%*	

NOTE: Disaggregated results for the cost of living by major category are provided in Section 5 and detailed raw data are provided in Appendix D.

IDENTIFYING AND MEASURING GEOGRAPHIC SHOPPING PATTERNS

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Methodology at a Glance

Goal: Develop a series of matrices that shows where residents of each school district shop for various goods and services.

1. *Prior to 2007, a shopping matrix developed in 1997 was used to identify shopping patterns. In 2007, Corona Insights, in consultation with the Colorado Legislative Council, began a multiyear effort to develop an ongoing matrix that could be updated biennially.*

2. *In 2007, 2009, and 2011, Corona has conducted roughly 2,700 surveys per cycle in strategically selected areas of the state. Early in the process, district shopping patterns were developed using mathematical models based on the survey data, but as more surveys are conducted, districts are converted from modeled data to using actual survey data specific to that district. As of 2011, sufficient data was available in 144 districts to rely solely on the survey data. In the other 34 districts, a combination of survey data and modeling is used. The goal of this portion of the study is to build up data for all districts over a 10 year period, where shopping patterns data is available for all Colorado School Districts. After 10 years, old data will be removed from the shopping patterns data base, and new data will be added to keep all shopping patterns data as fresh and representative as possible for the study.*

3. *Each survey respondent was asked to state the town in which his or her household made their most recent purchase of a sample of household goods. (They could also state that their last purchase was online, or that they never purchase that particular good.) Respondents in urban areas were also asked to provide the distance that they traveled, since some large communities contain more than one school district.*

4. *The survey instrument is provided in Appendix E. A slightly different format was used in the Colorado Springs area since that region used mailed surveys rather than telephone surveys. The reason for using mailed surveys was to better understand shopping patterns inside Colorado Springs.*

5. *The output of the model was a large matrix for each product category, where each row described the residents of an individual school district (a "home" district), and each column represented a district where goods or services could be purchased (a "buying" district). The intersection of a given row and column represented the proportion of purchases among residents of the "home" district who could be expected to purchase that product in that particular "buying" district. The sum of each row represented each home district's shopping pattern, totaling to 100 percent of purchases of that particular product. This matrix could then be multiplied by a matrix of prices for each product in each district to produce an overall price in the home district.*

6. *Online purchases were considered a "buying" district for calculation purposes. Prices were gathered from online outlets exactly as they were gathered from each school district. Calculations were performed identically for online shopping in comparison to geographic shopping areas.*

7. *In some instances, geographic outliers were identified in purchasing patterns. For example, a respondent may have identified a very distant town as a purchase location. Even though respondents were specifically told not to list purchase locations that may have occurred during travel, distant purchases are certainly possible in some scenarios (e.g., second-home ownership, driving for work, etc.) In instances where a respondent listed a location that was more than 100 miles away and which required passing through a larger community than the "buying" district, those purchases were reclassified as "distant Colorado", and a statewide average was used to estimate the price of the purchase. The reason for this is because these outliers were just that – outliers – and the aforementioned method accounts for the fact that some portion of purchases may happen in this manner, but that the location is not deemed to be representative. The system used accounted for the fact that these long-distance purchases may indeed occur, but they may not typically occur in the exact community that was identified.*

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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 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.

For all previous 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. For the 2007 study, Corona Insights was asked to update the analysis of geographic shopping patterns, and began developing a system that will allow for rolling updates on future studies. This rolling update will provide a more smooth accounting of the evolution of shopping patterns over time.

Ideally, updating the analysis of geographic shopping patterns would involve conducting statistically robust surveys in each and every school district, which would determine geographic shopping patterns for each product in the market basket. However, the large number of school districts in the state mean that this approach is not feasible, as the cost to do so would have been quite high (estimated at approximately one million dollars to complete the described ideal analysis in 2007, or in any year where an update was requested).

Since taking over the cost of living analysis in 2007, Corona Insights has taken an alternate approach to update and enhance the data collected for the shopping patterns matrix, and to build a permanent solution where updates are made on a rolling basis. The research team is building this system around a periodic survey that asks about geographic purchasing patterns for several types of products.

In order to develop a strong update for 2007 to replace the 1997 shopping matrix, a model-based system was used, where the surveys were used to inform not just geographic shopping patterns for a particular good or service by residents of each district, but also other goods and services purchased by residents of those districts, and similar goods and services purchased by residents in geographically similar districts. Where raw data was sufficient to draw geographic shopping patterns without modeling, the raw data was used instead. In the 2009 shopping patterns data, new surveys were combined with the previously collected surveys from 2007 and beyond to provide more power. Surveys were conducted in every district, but surveys were oversampled in specific districts so that the overall shopping patterns matrix could be developed from the raw data for as many districts as possible, reducing the need for model-based estimates. In 2011, this process was continued, once again focusing on areas that received less survey coverage in 2007 and 2009. As of 2011, 144 of the 178 districts are now data-based and the remaining 34 use a weighted model that is a combination of survey data for the district and survey data for selected adjacent districts. In the future, surveys will oversample the remaining model-based districts until all districts' shopping patterns are data-based. At that point, the system will be mature, and with each new survey the oldest data in the system will be replaced.

A total of 2,436 surveys were completed in 2011 using both a stratified random sampling technique and a

targeted listed sampling technique. After all of the 2,436 shopping patterns surveys were collected, they were merged with the 2009 and 2007 shopping patterns data (2,718 and 2,731 surveys, respectively) to create a large sampling of shopping patterns among Colorado residents over the past two years. The final shopping patterns matrix for 2011 used these data alone for shopping matrix development for districts with sufficient data to do so, and used a combined data/modeling approach for districts where data are not yet sufficient to eliminate the need for modeling.

The survey itself asks about purchasing patterns for a number of items. For small product categories, 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 metro areas were asked about both the town and the distance that they traveled. (Residents were also allowed to state that they bought the product online, or that they never buy the product.)

The eleven small product categories were:

- Non-perishable groceries such as canned goods
- Fruits, vegetables, or other produce
- Perishable groceries such as milk or ice cream
- Household products such as laundry soap, batteries, or toothpaste
- A meal at a restaurant
- Alcoholic beverages that were purchased to drink at home (not at a bar or restaurant)
- Clothes or shoes
- Gasoline
- Car maintenance and repair services
- Movie tickets at a theater
- Haircut

For the larger products, residents were asked if they had purchased in the past 3 years; and if so, whether they were living in their current community when they bought each one. They were then asked what city they purchased any such items in (which could included "online" if they bought the item on a computer). They were then asked what town or city they thought they would go to if they were going to buy these items tomorrow. The large products were:

- Major furniture item, mattress, or appliance
- Television

The larger 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 their purchase location if their last purchase was several years ago.

The final shopping patterns matrices are presented in Appendix F, and more detailed information about the methodology of the survey and model is presented at the end of Appendix F.

Methodology at a Glance

Goal: Gather pricing data for a large variety of goods and services in all school districts where those goods and services are sold.

Note. Different data collection techniques are used to collect the various items that made up the market basket. Below we provide a very short summary of the methodological approaches that were used to obtain prices for each category of goods. Additional overview information is provided in this section of the report, and detailed information is provided in Appendix B.

1.	**Retail Purchases** – *Pricing for a number of basic retail items was gathered on-site at retail stores across the state. These included all "food at home" items (perishables, non-perishables, and produce), alcoholic beverages, household goods, pet food, personal care products, tobacco, clothing, shoes, furniture, entertainment (TV), electronics, and restaurant meals.*

2.	**Service Purchases** – *Pricing for a number of services was gathered by making telephone calls to a stratified random sample of businesses across the state. This included prices for men's and women's haircuts, auto repair services, including an oil and filter change and front-end alignment, movie tickets, and auto loan rates. Gasoline prices are also gathered by telephone because all prices must be gathered on a single day.*

3.	**Housing** – *Average home values for a home with specified characteristics were provided by the Colorado Legislative Council as a product of a separate research contract with another consulting firm.*

4.	**Property Taxes** – *County and school district mill levies for each district are applied to the home values to obtain property tax costs for each school district.*

5.	**Homeowner's Insurance** – *Pricing data for a home with specified characteristics was provided by a large insurance company that provides coverage throughout the state.*

6.	**Utilities** - *Data on utility prices was gathered from the Public Utilities Commission via 2010 annual reports and/or sales reports filed by electric, telephone, and gas utility providers. (Some adjustment and estimation was required above and beyond the report data.)*

7.	**Water/Sewer** – *Data was gathered via phone calls from Corona Insights to over 250 cities and towns throughout the state, as well as visits to municipal web sites. Rates were then applied to specified "typical" usage rates.*

8.	**Day Care** – *Information by county was obtained from the 2011 Market Rate Survey of Child Care Providers, conducted by Qualistar Colorado as part of a contract with the Colorado Department of Human Services, Division of Child Care. These rates were then combined with data on the population of children in each age group and the proportion of children in day care in each age group obtained from the U.S. Census Bureau and the Department of Health and Human Services, and then applied to specific school districts.*

9.	**Transportation** – *Vehicle financing rates and fees were gathered for a specified vehicle (a 2009 Honda Civic) from local lending institutions throughout the state. Using the standard blue book value for purchase price, local sales taxes, payment costs (principal and interest), and registration and ownership taxes, costs were estimated by county and then mapped to school districts.*

For each category of market basket items listed below, we describe how the cost of those items was collected, and also summarize the amount of data that was collected in the 2011 study. Additional data collection details for each category are presented in Appendix B.

FOOD AT HOME

Food at home items consisted of potatoes, bananas, canned green beans, canned peaches, ground beef, whole fryer chicken, milk, white bread, spaghetti, coffee, soup, and frozen waffles. Prices for these items were gathered by in-person visits to grocery stores throughout the state. The number of grocery stores visited (and in metro areas, the selection of stores to visit) were determined with a sampling algorithm developed by Corona Insights, applied to a database of business listings provided by Dun & Bradstreet, that was supplemented with lists of Wal-Mart Supercenters and Super Targets. This was the same sampling methodology used in the two previous studies, to ensure comparability. All sampling for items making up the food at home category was done at the school district level after geo-coding business listings within the appropriate school district locations. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey to produce final prices for each district.

Detailed descriptions of the food at home items used in the 2011 market basket and the number of prices collected for each market basket item is provided in the table below:

		Food At Home		
CES Category	Specific Item	Description	Collection Method	N of Observations
Fruits and vegetables	Potatoes	Price for a 10 lb. bag of lowest price Russet potatoes. If 10 lb. bag is not available, substitute nearest sack size and note size. DO NOT USE PRICE OF POTATOES BY THE POUND.	On-Site	349
Fruits and vegetables	Bananas	Price per pound. If bananas are priced by the bag or by the banana, report the price and weigh a bunch, note weight and number of bananas in bunch. DO NOT PRICE ORGANIC.	On-Site	351
Fruits and vegetables	Canned Green Beans	Price of store brand cut green beans, 14.5 oz. If no store brand, collect the cheapest brand and note the brand.	On-Site	486
Fruits and vegetables	Canned Peaches	Price of store brand sliced peaches in heavy syrup, 15 to 15.25 oz. If no store brand, collect the cheapest brand and note the brand.	On-Site	455
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 if different percent lean. DO NOT PRICE FAMILY PACK. DO NOT PRICE PRE-FORMED BEEF PATTIES.	On-Site	353
Meats, poultry fish and eggs	Chicken, whole fryer	Price per pound of one whole fryer chicken, least expensive brand. If whole fryer not available, price whole fryer chicken, cut up and note.	On-Site	317
Dairy	Milk	Price for one gallon (128 Fl. oz.) 2% milk, store brand or lowest price. If no 2%, then price (in order of preference) 1%, skim, whole. Note if not 2%. NO ORGANIC, DO NOT PRICE SOY OR FLAVORED MILKS (e.g. chocolate, etc.). DO NOT PRICE HALF GALLON.	On-Site	519
Cereals and bakery products	White Bread	Price for store brand 24 oz. (1.5 lb.) loaf of sliced white bread. If store brand not available, record price of lowest priced brand with a 24 oz. loaf. Note any differences in brand or loaf size.	On-Site	472
Cereals and bakery products	Spaghetti	Price of store brand spaghetti noodles, 16 oz. package. If store brand is not available, record price of lowest priced brand and note brand.	On-Site	443
Other food at home	Coffee	Price for a 11.3 oz. can of Folgers Classic Roast Coffee, ground, red can. If Folgers not available, price Maxwell House 11.5 oz. Note brand and any size differences. DO NOT PRICE DECAFFINATED OR WHOLE BEAN. DO NOT PRICE ANY OTHER BRANDS.	On-Site	498
Other food at home	Soup	Price for a 10 ¾ oz. can of original Campbell's Chicken Noodle Soup. If no Campbell's (rare), price store brand and note brand and any size difference. DO NOT PRICE "HomeStyle" or "Classic" PACKAGING OR OTHER VARIATIONS.	On-Site	498
Other food at home	Frozen Waffles	Price of store brand frozen waffles, buttermilk or plain flavored, prebaked, 10 pack, 12.3 oz. If store brand not available, record price of lowest priced brand and note brand and any differences in size.	On-Site	383

FOOD AWAY FROM HOME

Food away from home items consisted of a cheeseburger meal, a pizza, and a steak meal. Prices for these items were gathered by in-person visits to restaurants throughout the state. The number of restaurants to be visited was determined with a sampling algorithm developed by Corona Insights, applied to a database of business listings provided by Dun & Bradstreet that was supplemented with Dex Online directory listings. All sampling for food away from home items was done at the school district level after coding the business listings to the appropriate school district. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey results to produce final prices for each district.

Detailed descriptions of the food away from home items in the market basket and the number of prices collected are provided in the table below:

Food Away From Home				
CES Category	**Specific Item**	**Description**	**Collection Method**	**N of Observations**
Restaurants	Lunch	Price for a McDonald's quarter pounder with cheese meal (including fries and a regular 21 oz Coke). If you're not collecting at a McDonald's, price a cheeseburger with a medium fries, and a coke (the most similar type meal to a quarter pounder with cheese meal).	On-Site	551
Restaurants	Dinner	Price for a Pizza Hut cheese pizza, regular or thin crust, 14" diameter (note size if other).	On-Site	298
Restaurants	Dinner	Price for 12 oz. New York Strip steak, potato, soup or salad. If they don't have a New York Strip steak in 12 ounces, get the price in whatever ounce size the steak comes in at that restaurant. If New York Strip not available, price a Ribeye. If the Ribeye is not available, price a Sirloin. Note size of steak if not 12 oz. DO NOT PRICE CHOPPED SIRLOIN. (Price this item at Applebees where available.)	On-Site	268

ALCOHOLIC BEVERAGES

Alcoholic beverage prices were collected for a 6-pack of beer. Prices were gathered by in-person visits to grocery and liquor stores throughout the state. Beer was treated as a grocery item and so the initial sample of stores were the grocery stores selected by the food at home sampling. However, because not all grocery stores sell beer, the sample of stores was supplemented with a list of Liquor Stores from Dun and Bradstreet. All sampling for alcoholic beverages was done at the school district level after coding the business listings to the appropriate school district. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey results to produce final prices for each district.

A detailed description of the alcoholic beverage item in the market basket and the number of prices collected are provided in the table below:

Alcoholic Beverages				
CES Category	Specific Item	Description	Collection Method	N of Observations
Alcoholic beverages	Beer	Price for a 6-pack of 12 oz. bottles Coors Light or Original beer, 3.2% alcohol by volume or higher. If Coors Light not available, then price (in order of preference) Coors original, Bud Light, Miller Light, Budweiser products. Note brand. DO NOT PRICE BOTTLES.	On-Site	553

HOUSING

Shelter – *Mortgage payment/Property taxes*

Similar to previous Cost of Living studies, home values were provided by an outside consultant. 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. Then property tax estimates were calculated based on the current assessment rate obtained from the 2011-2012 Final Residential Assessment Rate Study at Colorado.gov, and county and school district mill levies obtained from the 2010 Annual Report from the Colorado Department of Local Affairs.

Shelter – *Homeowner's Insurance*

In obtaining homeowner's insurance rates, hazard insurance was sought for a $100,000 frame dwelling built in 1970 with $80,000 contents coverage, $100,000 liability/medical payments, and a $1,000 deductible. These are the same specifications used in previous studies (with one exception – the deductible level is higher than in previous years, however this is the only deductible amount currently allowed by the insurance company that provided data). One homeowner's insurance company (with a market share in the top three of all homeowner's insurers in Colorado) was willing to provide homeowner insurance rates by zip code to Corona Insights to be used in the study. The rates were averaged to the school district level, then weighted by the home value for each district to obtain the final spending on insurance in each district.

Utilities - *Electric*

In order to calculate the average monthly electric bill for residents around the state, Corona Insights examined the 2010 Annual Reports filed by electric companies from around the state with the Colorado Public Utilities Commission (PUC). The detailed reports filed by electric companies provide enough information to calculate an average bill (for a company's service area). After all of the 2010 annual reports were gathered and analyzed, electric bill monthly rates were assigned to school districts based on the service areas for all electric companies operating in the state of Colorado.

Utilities - *Gas*

The methodology used to calculate the average monthly natural gas bill for Colorado school districts was similar to that described for electric providers (see above). Every natural gas provider operating in the state of Colorado is required to file natural gas sales figures by community with the Public Utilities Commission (PUC). These detailed reports were used to calculate an average bill for each service area. After all of the 2010 annual reports were gathered and analyzed, natural gas monthly rates were assigned to school districts based

on the service areas for all natural gas providers. It should also be noted that some service areas do not utilize natural gas, but instead depend on propane for their heating needs. In specific cases where services areas (and the school districts residing within those areas) used propane, Corona used data from the Energy Information Administration to calculate the relative cost of using propane for energy instead of natural gas, based on the actual energy output for each fuel in BTU's and the 2010 average cost for each fuel in Colorado. After determining this "conversion factor," the cost of propane service for each school district without natural gas service was computed by averaging the natural gas bills of the surrounding districts and inflating that average based on the analysis described above.

Utilities - *Telephone*

In order to calculate the average monthly telephone bill for residents around the state, Corona obtained telephone rates from the Public Utilities Commission's "2010 ILEC Annual Report." This report detailed the monthly base rates being charged by each "incumbent local exchange carrier" around the state. Once again, the methodology used to calculate the average monthly telephone bill within each school district mirrored the methodology described for electricity providers. The monthly base rates detailed in the "2010 ILEC Annual Report" were assigned to each of the school districts based on the providers' coverage areas. Additional to the base rates found in each school district, a variety of other fees (different depending on the area and provider) were incorporated into the final total monthly telephone bill for an area (and ultimately school district). Final monthly telephone rates were calculated for each district depending on the service providers in a districts area and the different fees attached to those providers operating within a specific school district.

Utilities – *Water/Sewer*

In order to determine the average monthly payments for water and sewer bills in each school district, Corona Insights conducted a telephone survey of over 250 cities throughout the state of Colorado in order to collect water/sewer rate information for municipalities located within Colorado's school districts. An attempt was made to collect data from each of the 256 agencies contacted in previous studies, but in certain municipalities or areas where no contact information could be found, or in towns that used only wells or septic tanks, proxy values were used based on the rates charged in the nearest town. Once all water/sewer rate information was collected, final district averages were calculated and weighted based on the total populations of cities and municipalities located within a school district.

Household Operations – *Day Care*

The average cost of child day care for the 2011 Cost of Living study was based on day care costs in each county in Colorado. Average day care cost information was obtained from the 2011 Market Rate Survey of Child Care Providers, conducted by Qualistar Colorado. The Market Rate Survey of Child Care Providers provides full-time weekly rates of caring for children between 0 and 12 months, 1 to 2 years, and between 2 to 5 years in all 64 Colorado counties.

In determining the average weekly costs for childcare services, the average of child care centers (CCC's) and family care centers (FCC's) for all age groups provided, 0 to 12 months, 1 to 2 years, and 2 to 5 years, was calculated. The averages were then weighted based on the national proportion of children in each age group from the U.S. Census Bureau, and the proportion of children in day care in each age group obtained from U.S. Census Bureau, Survey of Income and Program Participation, 2010, and the Department of Health and Human Services data on children participating in CCDF-funded programs. These rates were then combined with data on the population of children in each age group and then applied to specific school districts.

Weekly rates were then converted to a monthly cost by multiplying the weekly cost of care by 52 weeks

per year and then dividing it by 12. Final district average prices were assigned from the appropriate county in which the district resides.

Housekeeping Supplies – *Laundry Soap*

Expenditures for housekeeping supplies were gathered by collecting prices for laundry soap. Prices were gathered by in-person visits to grocery stores throughout the state. Laundry soap was treated as a grocery item and so the stores sampled were the grocery stores selected by the food at home sampling, as well as discount department stores like Target and Walmart. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey to produce final prices for each district.

A detailed description of the housekeeping supplies item in the market basket and the number of prices collected are provided in the table at the end of this section (below).

Household Furnishings and Equipment - *Refrigerator*

Expenditures for household furnishings were gathered by collecting prices for refrigerators. Prices were gathered by phone calls to department stores and electronics stores throughout the state. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey to produce final prices for each district. (For this category we also collected mattress prices in 2011 by in-person visits to furniture and mattress stores throughout the state, however because of increasing difficulty in pricing comparable mattresses at each location, we decided to use the refrigerator item as a proxy for this category instead of the mattress item.)

A detailed description of the household furnishings item in the market basket and the number of prices collected are provided in the table at the end of this section (below):

Housing				
CES Category	**Specific Item**	**Description**	**Collection Method**	**N of Observations**
Shelter	Mortgage Payment	Mortgage payment, including principle, interest, and property taxes, based on housing values provided by outside consultant.	Online	
Shelter	Homeowners' Insurance	$100,000 frame dwelling built in 1970. $80,000 contents coverage, $100,000 liability/medical payments. $1,000 deductible.	Call	1 for each zip code (589)
Utilities	Utilities	Annual average bill for electric, natural gas, telephone, and water and sewer services collected from utility providers throughout the state.	PUC Database/Call	
Household Operations	Day Care Services	Weekly cost of child day care.	Database	1 per county
Housekeeping Supplies	Laundry Soap	Price for Tide liquid household laundry detergent, 50 Fl. oz. Original only (may say with Acti-Lift.) If Tide is not available, price of Cheer. Note brand and size. DO NOT PRICE LARGER OR SMALLER SIZES. DO NOT PRICE HE, COLDWATER, TOTAL CARE, TIDE WITH BLEACH, or TIDE WITH FEBREEZE VARIETIES.	On-Site	443
Household furnishings and equipment	Mattress	Price of Queen size mattress. Sealy Posturepedic with 736 coils where possible. If not available, price Simmons Beautyrest with 759 coils, then SpringAir with 700 coils, then Serta with 800 coils. Price full set (mattress / box spring.) Find out if price includes bed frame and delivery in local area. If not, get prices for frame and delivery.	On-Site	112
Household furnishings and equipment	Refrigerator	Price of a stainless steel, side-by-side refrigerator, 25.1 cu. ft. (or closest available), standard depth (not counter depth), with an ice and water dispenser in the door. Price the cheapest brand and model they have in stock that meets the description. It is important to get the regular price and not any sale price that might be currently available. (Amana, Kenmore, Maytag, and Whirlpool all make this size.)	Calls	87

APPAREL

Apparel items consisted of men's dress shirts, men's T-shirts, women's pantyhose, women's polo-shirts, and men's canvas lace-up shoes. Prices for these items were gathered by in-person visits to clothing stores throughout the state. The number of clothing stores visited was determined with a sampling algorithm developed by Corona Insights and applied to a database of business listings provided by Dun & Bradstreet. The Dun & Bradstreet list was also supplemented with lists of Wal-Mart Supercenters and Super Targets so that apparel prices would also be obtained at these supercenters. All sampling for clothing items was done at the school district level after coding the business listings to the appropriate school district. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey results to produce final prices for each district.

Detailed descriptions of the apparel items in the market basket and the number of prices collected are provided in the table below:

Apparel				
CES Category	**Specific Item**	**Description**	**Collection Method**	**N of Observations**
Men and Boys	Men's Dress Shirt	Price for white or solid color Oxford (button-down collar), long sleeve, button cuff shirt. Arrow brand where possible, poly/cotton blend. If store does not have Arrow, price comparable label that meets the same criteria. Try to get prices for shirts sized 15/32 through 16/34.	On-Site	188
Men and Boys	Men's T-Shirt	Price for one 3-pack of men's white t-shirts, v-neck. Hanes brand where possible, Fruit of the Loom or Jockey, otherwise, 100% cotton. Must be in a 3-pack.	On-Site	170
Women and Girls	Women's Pantyhose	Price of Legg Sheer Energy pantyhose, with control top and sheer toe design, size M. If not available, price the most similar type Legg pantyhose. If Legg pantyhose is not available, price the most similar available brand of pantyhose. Note brand and features.	On-Site	360
Women and Girls	Women's Polo Shirt	Price a women's (not juniors) solid color, short-sleeved polo shirt, with no pocket, ribbed collar & sleeve cuffs, size M. 100% cotton or cotton/spandex blend. Price store label or, if none, price least expensive brand. At Target, price Merona brand, at Walmart, price Riders or Dickies brand (if not available, then price Faded Glory brand), at Kmart, price Basic Editions brand.	On-Site	168
Footwear	Men's Canvas Lace-up Shoe	Price a men's canvas lace-up sneaker, flat bottom (no arch), with molded or ridged tread, size 9 - 11. Price the lowest priced men's canvas shoe that meets the described criteria.	On-Site	199

TRANSPORTATION

Vehicle Financing

Vehicle financing estimate were derived by contacting lending institutions in all possible districts and gathering data on finance rates and fees for a four-year loan for a 2009 Honda Civic LX Sedan. The Corona Insights team then calculated a monthly payment that included the purchase price, sales tax, loan charges, and any applicable taxes, title fees, or registration fees.

Vehicle insurance

Insurance companies with a large market share for vehicle insurance in Colorado were determined by analyzing the 2010 "Annual Report of the Commissioner of Insurance". Companies with the largest market share were then contacted to determine vehicle insurance rates by zip code. Corona was able to obtain vehicle insurance data (by zip code, for the entire state) from one willing insurance company. That insurance company had a large portion of the market share in Colorado (the company's name will not be released, in order to ensure pricing confidentiality of the company).

Insurance rates were gathered and averaged for the two vehicles types used throughout the study (a 2009

Honda Civic and a 2007 Ford Ranger) at the zip code level and the reassigned to the proper school district (in order to determine final vehicle insurance costs per district).

Vehicle expenses – Oil Change & Front-End Alignment

Vehicle maintenance expense items consisted of oil changes and front-end alignments. Prices for these items were gathered by phone calls to auto repair shops throughout the state. The number of shops to sample was determined with a sampling algorithm developed by Corona Insights which was applied to a database of business listings provided by Dun & Bradstreet. In areas where the original Dun & Bradstreet list of business was insufficient, Dex Online yellow pages were utilized to create a more robust list of vehicle maintenance businesses. All sampling for vehicle maintenance items was done at the school district level after coding the business listings to the appropriate district. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added where applicable, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey results to produce final prices for each district.

Detailed descriptions of the vehicle maintenance items in the market basket and the number of prices collected are provided at the end of this section.

Gasoline

Gasoline prices were gathered on a single day via telephone calls to gas stations throughout the state. The number of shops to sample was determined with a sampling algorithm developed by Corona Insights which was applied to a database of business listings provided by Dun & Bradstreet. In areas where the original Dun & Bradstreet list of business of gas stations was insufficient, Dex Online yellow pages were utilized to create a more robust list of gas stations. All sampling for gasoline prices was done at the school district level after coding the business listings to the appropriate district. After prices were collected, the dataset of prices for each item was screened for outliers, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey results to produce final prices for each district.

Detailed descriptions of the transportation items in the market basket and the number of prices collected are provided in the table below:

Transportation				
CES Category	**Specific Item**	**Description**	**Collection Method**	**N of Observations**
Transportation	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 2009 Honda Civic for four years. (2009 Honda Civic LX Sedan, 4-door. Engine: 4-cyl. 1.8 liters. Trans: 5-speed manual. Mileage: 24,000. Amenities: air conditioning, pwr. steering, cruise control, air bags)	Online (Bluebook Values) Call	457
Transportation	Vehicle Insurance	Insurance premiums for 2007 Ford Ranger and 2009 Honda Civic (2007 Ford Ranger XL Long Bed Pickup. Engine: V6 4.0 liter, Trans: 5-speed manual, Drive: 2-wheel drive. Mileage: 60,000. Amenities: A/C, pwr. steering, cruise control, air bags standard)	Call	1 for each zip code (504)
Transportation	Oil and Filter Change	Price of an oil and filter change for a 2007 Ford Ranger pickup. Oil must not be synthetic; filter should be the least expensive available.	Call	462
Transportation	Front-End Alignment	Price of front-end alignment for a 2007 Ford Ranger pickup; 2 wheel drive.	Call	240
Transportation	Gasoline	Price of self-serve, 85 Octane, unleaded gasoline.	Call (one-day)	520

HEALTH CARE - HEALTH INSURANCE MONTHLY PREMIUM

In order to determine the average monthly health insurance premium rate in each school district, Corona Insights collected rate information from four of the largest health insurance providers in the state. Data was collected for PPO's from three of the companies, and an HMO from the remaining provider. Rates for the two most popular plans for each of the four participating companies were obtained. Heath insurance monthly premium rates were collected by zip code and/or county (depending on the provider) and weighted averages were created for each health care company (based on market share). Final health care costs were then assessed by zip code or county final data and then appropriated to the appropriate school district.

Note: Final monthly health care costs were assessed with the assumption that monthly costs were for a family of three non-smokers who were all in good shape. Criteria are detailed in the table below:

Health Care				
CES Category	**Specific Item**	**Description**	**Collection Method**	**N of Observations**
Health Care	Health Insurance Premium	Monthly cost of family health insurance coverage for a family of three, all non-smokers, all in good health.	Database	6-8 per county

ENTERTAINMENT

Entertainment items consisted of movie tickets, a television, batteries, and pet food. Prices for movie tickets were gathered by phone calls to movie theaters throughout the state. Prices for television, batteries, and pet food were gathered by in-person visits to grocery and electronics stores throughout the state. The number of stores visited was determined with a sampling algorithm developed by Corona Insights that was applied to a database of business listings provided by Dun & Bradstreet. The Dun & Bradstreet list was also supplemented with lists of Wal-Mart Supercenters and Super Targets so that entertainment item prices would also be obtained at these supercenters. All sampling for entertainment items was done at the school district level after coding the business listings to the appropriate school district. After prices were collected, the dataset was screened for outliers, taxes were added where applicable, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey results to produce final prices for each district.

Detailed descriptions of the entertainment items in the market basket and the number of prices collected are provided in the table below:

Entertainment				
CES Category	Specific Item	Description	Collection Method	N of Observations
Fees and Admissions	Movie	Price of adult admission to a first-run, full-length movie.	Call	81
Television, Radios, Sound Equipment	TV	Price of a 32" flat screen, LCD TV: 720p, 60Hz HDTV. Samsung brand. If not available, LG brand, then Sony, then Panasonic. Note brand and any differences in size or features. Do not price 1080p models. Do not price Plasma, LED, or 3D models.	On-Site	184
Other supplies, equipment, and services	Batteries	4 Pack AA Batteries. Energizer brand; if not available then Duracell, otherwise cheapest 4 pack of AA. DO NOT PRICE LITHIUM BATTERIES. DO NOT PRICE RECHARGEABLES.	On-Site	494
Pets, Toys, and Playground Equipment	Pet Food	Price for a 5.5 oz. can of Friskies cat food. If Friskies not available, price of 9 Lives or Whiskas.	On-Site	497

PERSONAL CARE PRODUCTS AND SERVICES

Personal care items consisted of haircuts, shaving cream, toothpaste, and tampons. Prices for men's and women's haircuts were gathered by phone calls to beauty and barber shops throughout the state. Prices for shaving cream, toothpaste, and tampons were gathered by in-person visits to grocery stores and drug stores throughout the state. The number of stores visited was determined with a sampling algorithm developed by Corona Insights that was applied to a database of business listings provided by Dun & Bradstreet. The Dun & Bradstreet list was also supplemented with lists of Wal-Mart Supercenters and Super Targets so that personal care product prices would also be obtained at these supercenters. All sampling for personal care items was done at the school district level after coding the business listings to the appropriate school district. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added where applicable, average prices were computed for each district, and then average prices were weighted using

the shopping patterns survey results to produce final prices for each district.

Detailed descriptions of the personal care items in the market basket and the number of prices collected are provided in the table below:

Personal Care Products and Services				
CES Category	Specific Item	Description	Collection Method	N of Observations
Pesonal Care Services	Man's Haircut	Price of man's wash, cut and dry.	Call	569
Pesonal Care Services	Woman's Haircut	Price of woman's wash, cut and dry.	Call	543
Personal Care Products	Shaving Cream	Price of Barbasol regular shaving cream 11.0 oz. If you can't find Barbasol, price Gillette.	On-Site	483
Personal Care Products	Toothpaste	Price of Crest regular Paste Tartar Protection 6.4 oz. If Crest not available, get Colgate 6.4 ounces. Note brand and size. DO NOT PRICE CREST PRO-HEALTH, WHITENING, WITH SCOPE, OR OTHER VARIETIES.	On-Site	477
Personal Care Products	Tampons	Price for one box of Tampax Regular Absorbency, 20 ct. Note if different size box. DO NOT PRICE SLENDER STYLE OR PEARL.	On-Site	486

TOBACCO

Tobacco and smoking expenditures were represented by a carton of cigarettes. Prices for cigarettes were gathered by in-person visits to grocery stores throughout the state. The number of stores visited was determined with a sampling algorithm developed by Corona Insights that was applied to a database of business listings provided by Dun & Bradstreet. The Dun & Bradstreet list was also supplemented with lists of Wal-Mart Supercenters and Super Targets so that tobacco prices would also be obtained at these supercenters. All sampling for tobacco items was done at the school district level after coding the business listings to the appropriate school district. After prices were collected, the dataset of prices for each item was screened for outliers, taxes were added, average prices were computed for each district, and then average prices were weighted using the shopping patterns survey results to produce final prices for each district.

A detailed description of the tobacco item in the market basket and the number of prices collected are provided in the table below:

Tobacco Products/Smoking Supplies				
CES Category	Specific Item	Description	Collection Method	N of Observations
Tobacco	Cigarettes	Price for one carton (200 cigarettes) of Marlboro Filter, hard pack, flip-top cigarettes. If Marlboro is not available,price Camel cigarettes.	On-Site	485

READING, EDUCATION, AND MISCELLANEOUS EXPENSES

The major expenditure categories for Reading, Education, Miscellaneous Expenses, Cash Contributions, and Personal Insurance and Pensions were considered to be constant for the relevant benchmark household and were not sampled in this 2009 Cost of Living study. These categories have been held constant throughout all previous Cost of Living studies. No geographical variations are expected for these across the state of Colorado, so all districts receive the same average costs for each of these categories.

PERSONAL (INCOME) TAXES

Income taxes for the benchmark family are calculated for each district itemizing deductions for mortgage interest and property taxes as well as ownership taxes on the vehicles.

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 integrated with 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 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 are collected represent the full 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 of their purchases in the school district in which they live. The shopping patterns survey gathered data which examined where people shop for 12 categories of items and services: produce, perishable groceries, non-perishable groceries, alcoholic beverages, household products, clothing and shoes, gas, car maintenance and repair, furniture and appliances, TVs, and where they go for haircuts and restaurant meals. For each of these items, Corona Insights developed matrices that specify where people living in each district shop for each item. 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.

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 in the 2007 cost of living study, the majority of the market basket items were sampled by school district in 2009. This helped to ensure that all final cost of living data was specific to an exact school district. In a few cases the data was 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 conducted 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, and 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. Details of the statistical methods involved were provided in an appendix to the 2007 Cost of Living Report, and are further discussed in Appendix G of the 2009 report, which is reproduced in this report as well for documentation.

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 even 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 G 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 direct by major expenditure category.

Readers receiving this report electronically will need to review an accompanying spreadsheet file, due to the volume of data.

APPENDIX B: DETAILED METHODOLOGICAL DISCUSSION – DATA COLLECTION

In Section 4 of the report, a methodological overview is provided regarding the data collection methods for each major expenditure category, and for the development of geographic shopping patterns matrices. Appendix B provides additional detail on those topics for the interested reader.

In the bulk of this appendix, data collection techniques are expanded upon. Notable sampling techniques, data collection procedures and weighting techniques are expanded upon for each major expenditure category.

Reporting Note: Where sampling, data collection, and weighting techniques were identical between expenditure categories, these techniques will not be repeated in each write-up in order to reduce redundancy. To facilitate this, we have grouped items based on the methodology used to collect data those items.

FIELD DATA COLLECTION

Training Note: A Corona research manager who has been involved in both past data collections for this project was in charge of training and overseeing the staff. Corona recruited temporary contractors to perform the data collection. These contractors were hired in the region they would be working; this helped facilitate local knowledge of communities and stores, and helped manage travel costs for the project. All hires were screened, interviewed, and background checked prior to employment. Data collectors were paid hourly, plus expenses. To encourage efficient and quality work, an incentive structure was set up based on timely work, accurate price collection, and accurate data entry.

When initially hired, Corona provided an overview and training guide for data collectors to review prior to training, as well as to have with them while doing data collection. Corona then conducted a two-hour training with all data collectors in each region, including in-store training. Training time was focused on the importance of collecting data in the exact same manner across the state, including a thorough review of the market basket and substitutions, following the sampling plan of stores, how to record prices, and how to enter data. The research manager and other Corona staff were available for questions by telephone during the entire data collection period. The research managers also made periodic check-in calls with the data collectors to answer questions and monitor progress. Data was recorded on paper, then entered online. Corona retained the paper data sheets and did random data quality checks on each data collector.

Most of the field data collection was completed in a two-week period. In the first week, the field research manager drove around the state conducting trainings at each location. Data collectors had one week to complete their districts, and then the field research manager made a second loop around the state to follow-up with data collectors at each location, collect materials, and so on. While in the field, the field research manager conducted random data checks to ensure the right stores were visited and correct prices were collected. Some front range metro districts require more than one week of data collection because of the number of stores to be visited, but data collectors in those regions came to Corona's Denver office for trainings and debriefings.

FOOD AT HOME

All Food At Home item prices were collected in-person throughout each of the 178 school districts in Colorado. Business listings for grocery stores in Colorado were collected from the Dun & Bradstreet

database. This list was supplemented with a complete list of Wal-Mart Supercenters and Super Target locations to ensure that food prices were collected at these stores. Corona labeled each of the businesses with the school district it is located in using arc-GIS software. Then we developed a sampling plan based on the number of businesses in each school district, which resulted in a goal of sampling the larger of five (businesses) or five percent of businesses in each district. Corona attempted to sample all businesses from districts with fewer than five stores in a given category. In metro area districts with large numbers of businesses in each category, the businesses to be sampled were chosen based on store revenues provided by Dun & Bradstreet. The total revenue for a district was divided by the number of stores to be sampled from that district (n), then stores were rank-ordered by their revenue values and one store was chosen from each n-tile of the distribution.

Field research was then conducted by Corona Insights data collection team who visited each district and attempted to collect prices from the number of stores identified by the sampling plan. Gathering prices at gas stations or convenience stores was to be avoided unless no other businesses could be identified in a district. All data that was collected by the data collection team was uploaded to a final database with market basket prices for all goods and for all districts. The database was checked for outliers by identifying prices that were outside three standard deviations from the mean for their region (using regions from the shopping patterns survey to group similar districts together). Grocery tax for each location was then added to each price, and an average price was calculated for each district.

FOOD AWAY FROM HOME

All Food Away From Home item prices were collected in-person throughout the school districts. Business listings for eating places in Colorado were collected from the Dun & Bradstreet database, and then Corona labeled each by school district using arc-GIS software. The sampling plan for items in the Food Away From Home Category was developed similarly to the Food At Home Category (see above). The main difference between the sampling for the Food Away From Home Category was data collectors were asked to obtain at least three different prices for each of the three different Food Away From Home items (that would be three different prices in each district for cheeseburgers meals, pizza meals and steak meals). In Colorado metro areas with a plethora of eating places, data collectors were instructed to obtain an increased number of prices for each Food Away From Home item so that the overall sample for those districts would be more representative of the overall eating places district population. Corona attempted to sample all businesses from districts with fewer than three stores in a given category (cheeseburger, pizza or steak dining establishments).

Field data collection and training was conducted and entered with the same research method described in the **Food At Home section (see above)**. It should be noted that since 2009 prices have been gathered at fast food restaurants, specifically for the cheeseburger meal. This methodological shift was made in an effort to enhance the comparability of cheeseburger meals across all districts. All outliers for Food Away From Home were analyzed and checked with the same method described in the Food At Home Section (see above). Dining tax for each location was then added to each price, and an average price was calculated for each district.

ALCOHOLIC BEVERAGES

All Alcoholic Beverage item prices (a six pack of beer) were collected in-person throughout the school districts. Alcoholic Beverage prices and Food At Home items were collected at the same time and utilized the same methodology (**see Food At Home detailed methodology**, above). Beer prices were collected at all grocery stores where beer was sold. In districts where beer prices were not obtainable at grocery stores (or if there were too few grocery stores available in a district), data collectors were instructed to obtain beer prices at local convenience or liquor stores. It should be noted that business listings for liquor stores in Colorado were collected from the Dun & Bradstreet database and added to the final data collector list of stores to be

sampled (data was collected primarily at liquor stores in districts that had fewer than five total grocery stores to be sampled). Liquor stores were also geo-coded and labeled to the appropriate district using arc-GIS.

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district.

HOUSING - HOUSEKEEPING SUPPLIES – LAUNDRY SOAP

All Housekeeping Supplies item prices were collected in-person throughout the school districts. Laundry soap was used as the item to be collected for the Housekeeping Supplies Category. Laundry Soap prices were collected at the same time and using the same sampling methodology described for Food At Home items (see **Food At Home Methodology Section**, above).

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district.

APPAREL

Apparel prices were collected in-person throughout the school districts. The apparel items to be collected for the Apparel Category included Men's dress shirts, Men's T-shirts, Women's pantyhose, Women's T-shirts, and Men's canvas lace-up shoes. Business listings for apparel business in Colorado were collected from the Dun & Bradstreet database. The Dun & Bradstreet list was also supplemented with lists of Wal-Mart Supercenters and Super Targets so that apparel prices would also be obtained at these supercenters. Corona then geo-coded and labeled each apparel store into the appropriate school district using arc-GIS software.

Similar to the sampling plan detailed in Food At Home (see above), the sampling plan for apparel was based on the number of businesses in each school district, which resulted in a goal of sampling the larger of five (apparel stores) or five percent of apparel stores in each district for each apparel item. Corona attempted to sample all apparel stores from districts with fewer than five stores in a given category. Overall, in each district it was the minimum goal to obtain five different prices for each item, but this was not possible in many districts which did not have five total apparel stores.

It should be noted that specific brands and types of clothing items were targeted for pricing for each item, but often those specific brands would not be available within a given store. When this was the case, data collectors were instructed to find brands and item types which most closely replicated the initial target brands.

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price for each apparel item was calculated for each district.

ENTERTAINMENT – TELEVISION SET

In previous Cost of Living Studies, the market basket good for Television, Radios and Sound Equipment was a 20 inch RCA television, and then a DVD Player. Due to the increasing technological changes in the television electronics landscape at the current time, in 2011 Corona Insights and the Colorado Legislative Council agreed to change this market basket item once again to a television set in order to select a specific item that would be commonly available across stores and across districts. Television prices were collected in-person throughout all of the districts.

Business listings for electronics and home appliance stores in Colorado were collected from the Dun & Bradstreet database, and Dex Online yellow pages information was used to supplement those lists when additional electronics stores were needed to sample in a specific district. Each electronic store was then geo-coded and labeled into the appropriate school district using arc-GIS software.

Similar to the sampling plan detailed in Food At Home (see above), Corona attempted to sample the larger of five (electronics stores) or five percent of all electronics stores in each district. Ultimately, many of the smaller (mostly rural) districts often did not have electronics stores, and in those districts data collectors would do their best to obtain at least one price per district. In several districts, there were no TV prices to be obtained (due to a general shortage of available stores selling TVs in that district).

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district.

ENTERTAINMENT – BATTERIES

All battery prices were obtained in-person at the same time grocery prices were collected. Therefore, the sampling, data collection and analysis plan for batteries is exactly the same as described in the **Food At Home Methodology section** (see above).

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district. It should be noted that film was gathered in previous Cost of Living studies, and in 2007 Corona Insights and the Colorado Legislative Council agreed to substitute battery prices for film prices for the 2007 study. Use of battery prices as an entertainment item was continued in the 2011 study.

ENTERTAINMENT – PET FOOD

All pet food prices were sampled in-person at the same time grocery prices were collected. Therefore, the sampling, data collection and analysis plan for pet food is exactly the same as described in the **Food at Home Methodology** described earlier in this section (see above). Cat food was the specific item priced for pet food.

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district.

PERSONAL CARE PRODUCTS - SHAVING CREAM, TOOTHPASTE, TAMPONS

All personal care product prices such as shaving cream, toothpaste and tampons were sampled in-person at the same time grocery prices were collected. Therefore, the sampling, data collection and analysis plan for shaving cream, toothpaste, and tampons is exactly the same as described in the **Food at Home Methodology** described earlier in this section (see above).

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price for each personal care product, and an average price was calculated for each district for each of the three products in this category.

TOBACCO

Cigarette prices were sampled in-person at the same time grocery prices were collected. Therefore, the sampling, data collection and analysis plan for cigarette prices is exactly the same as described in the **Food at Home Methodology** described earlier in this section (see above). An attempt was made to obtain cigarette prices at all grocery stores that were visited by data collectors. Similar to the sampling approach used for beer prices, data collectors were instructed to obtain cigarette prices at local convenience or liquor stores in districts where cigarette prices were not obtainable at grocery stores (or if there were too few grocery stores available in a district).

It should be noted that business listings for liquor stores in Colorado were collected from the Dun & Bradstreet database and added to the final data collector list of stores to be sampled for cigarettes (cigarette data was collected primarily at liquor stores in districts that had fewer than five total grocery stores to be sampled). Liquor stores were also geo-coded and labeled to the appropriate district using arc-GIS. The Dun & Bradstreet list was also supplemented with lists of Wal-Mart Supercenters and Super Targets so that cigarette prices would also be obtained at these supercenters.

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district.

DATA COLLECTION BY PHONE

HOUSING - HOUSEHOLD FURNISHINGS AND EQUIPMENT – REFRIGERATOR

In previous years, mattress prices were used to represent the Household Furnishings and Equipment category, however because of difficulties in pricing this item (see Appendix C for details), refrigerator prices were collected for this category instead in 2011. Normally, this would be a field data collection item, however, because it was added to the market basket late, it was instead collected by telephone calls to business. In future years, it would be best included in the field collection plan. Business listings for appliance stores in Colorado were collected from the Dun & Bradstreet database, and then Corona labeled each by school district using arc-GIS software. Additional listings for appliance stores were obtained from web sources to ensure that small-town appliance dealers (e.g., Sears Hometown Stores) were represented. The sampling plan for refrigerators was developed similarly to the Food At Home Category (see **Food At Home Methodology section**, above) in that the goal was to sample the larger of five (appliance businesses) or five percent of appliance businesses in each district.

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district.

TRANSPORTATION – OIL AND FILTER CHANGE

Oil Change prices were collected by telephone for every district. Business listings for automobile maintenance and repair shops in Colorado were collected from the Dun & Bradstreet database, and Dex Online yellow pages information was used to supplement those lists when additional automobile maintenance shops were needed to sample in a specific district. Each gas station was then geo-coded and labeled into the appropriate school district using arc-GIS software. The Oil Change Prices obtained were for a 2005 Ford Ranger (see the Transportation table in Section 4).

Similar to the sampling plan detailed in Food At Home (see above), Corona attempted to sample the larger of five (auto maintenance shops) or five percent of all auto maintenance shops in each district. Ultimately in many of the smaller (mostly rural) districts where fewer automotive maintenance and repair shops existed, an attempt to obtain oil change prices was made at any (and all) maintenance shops available in the district.

After all data was collected, entered and outliers were analyzed and removed, sales tax was added to each price, and an average price was calculated for each district. It should be noted that sales tax was only applied to the parts of an oil change, and this was standardized across all oil change prices to reflect approximately 40 percent of the total oil change price. Therefore, 40 percent of all final oil change prices were taxed with the local sales tax, and the remaining 60 percent was left untaxed.

TRANSPORTATION – FRONT-END ALIGNMENT

Front-End Alignment prices were collected at the same time and with the exact same methodology as Oil Changes (see Oil Change Methodology, above). After all data was collected, entered and outliers were analyzed and removed, an average price was calculated for each district. It should be noted that no tax was applied to Front-End Alignment prices, because it is considered a service that is not taxed.

TRANSPORTATION – GASOLINE

Gasoline prices were gathered on a single day via telephone calls to gas stations throughout the state. All gas prices had to be obtained on the same day due to the relative instability of gas prices on a national and regional level. Unleaded grade 85 octane gasoline was priced for the category. Business listings for gas stations in Colorado were collected from the Dun & Bradstreet database. Each gas station was then geo-coded and labeled into the appropriate school district using arc-GIS software.

Similar to the sampling plan detailed in Food At Home (see above), the sampling plan for gas stations was based on the number of businesses in each school district, which resulted in a goal of sampling the larger of five (gas stations) or five percent of all gas stations in each district. Corona attempted to sample all gas stations from districts with fewer than five stores in a given category, and an attempt was made to obtain gas prices for each district (though some districts had no gas stations located in their boundaries or the few gas stations that were in their boundaries would not divulge that information over the phone).

After all data was collected, entered and outliers were analyzed and removed, an average price was calculated for each district.

ENTERTAINMENT – MOVIE TICKET

Movie Ticket prices were collected by telephone for every district. Business listings for movie theaters in Colorado were collected from the Dun & Bradstreet database, and Dex Online yellow pages information was used to supplement those lists when additional movie theaters were needed to sample in a specific district. Each movie theater was then geo-coded and labeled into the appropriate school district using arc-GIS software.

Data collectors were instructed to obtain the price of an adult admission ticket for each movie theater sampled, and only movie theaters showing current release movies were sampled (no Dollar Movie Theater prices were used in the final district averages).

After all data was collected, entered and outliers were analyzed and removed, an average price for movie tickets was calculated for each district. It should be noted that no tax was applied to movie theater prices, because it is not considered a taxable good.

PERSONAL CARE PRODUCTS AND SERVICES – MEN'S & WOMEN'S HAIRCUTS

Both men's and women's haircut prices were collected by telephone for every district. Business listings for beauty salons and barber shops in Colorado were collected from the Dun & Bradstreet database, and Dex Online yellow pages information was used to supplement those lists when additional beauty salons/barber shops were needed to sample in a specific district. Each beauty shop/barber shop was then geo-coded and labeled into the appropriate school district using arc-GIS software.

Data collectors were instructed to ask for the price of full cut, wash and dry haircut. Each beauty salon/barber shop were asked for the price of both women's and men's haircuts, but some stores only offered either women's or men's cuts.

Corona attempted to sample the larger of five (beauty shops) or five percent of all beauty shops in each

district for both men's and women's haircuts. As seen in other market basket categories, many of the smaller (mostly rural) districts often did not have as many beauty shops, and in those districts data collectors would do their best to obtain at least one price per district.

After all data was collected, entered and outliers were analyzed and removed, an average price was calculated for each district. No sales tax was applied to the final haircut prices, because haircuts are considered a service not a taxable good.

TRANSPORTATION – VEHICLE PAYMENTS

Vehicle financing rates and fees, which are one component of calculating vehicle payment costs, are collected by telephone calls to banks and credit unions in every district. See additional detail in the "Vehicle Payments" subsection under "Data Collection from Miscellaneous Database Sources."

DATA COLLECTION FROM MISCELLANEOUS DATABASE SOURCES

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, 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 8.59% for 2011. 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.

In order to get mill levies, the 2010 annual report for the Department of Local Affairs was obtained from the following website, (http://www.colorado.gov/cs/Satellite/DOLA-Main/CBON/1251594453029). This report was the most recent report available from the Division of Property Taxation. The report includes 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). This value is the property tax. This process was repeated for all school districts.

HOUSING – SHELTER – HOMEOWNER'S INSURANCE

Insurance companies with a large market share for homeowner's insurance in Colorado were determined by analyzing the 2010 "Annual Report of the Commissioner of Insurance". These companies were contacted to determine homeowner's insurance rates by zip code. In obtaining homeowner's insurance rates, hazard insurance was sought for a $100,000 frame dwelling built in 1970 with $80,000 contents coverage, $100,000 liability/medical payments, and a $1,000 deductible. These are the same specifications use in previous studies.

The rates were provided to Corona Insights by zip code. The rates were averaged to the school district level, then weighted by the home value for each district to obtain the final spending on insurance in each district.

HOUSING – UTILITIES – ELECTRIC

In order to calculate the average monthly electric bill for residents around the state, Corona examined the 2010 Annual Reports filed by electric companies from around the state with the Colorado Public Utilities Commission. Specifically, these reports contain data about each company's annual residential revenues and average number of residential customers. Using this information, it is possible to calculate an average bill, which includes both base and usage fees charged by each electric company.

In a select few cases, data for a company or municipality electric provider was not available from the Public Utilities Commission. In such cases, telephone calls were made to the offices of the appropriate organization to obtain their annual revenues and number of customers so that an average billing rate could be calculated as described above.

After an average bill had been calculated for each of the state's electric providers, these rates were assigned to each of Colorado's 178 school districts. In cases where a single organization provides electric service for the entire school district, this process was very straightforward. In some cases, however, a single school district may have as many as three major electric providers. In this situation, the school district's average billing weight was calculated by averaging the district's billing rates, weighted by the number of people in the district covered by each electric provider.

One possible limitation of this methodology is that each electric provider's annual report only contains data on their service area as a whole. For some providers which have a fairly small service area, this likely results in an accurate value being assigned to each school districts. For providers which serve a highly-varied area, however, this average may tend to underestimate the high-usage areas and overestimate the low-usage areas.

HOUSING – UTILITIES – GAS

In order to calculate the average monthly natural gas bill for residents around the state, Corona used a methodology very similar to that described for electric providers. Each of the state's natural gas providers is required to file their sales of natural gas by community with the PUC each year. As with the annual reports for electric providers, these filings contain annual residential revenues and residential customers for each of the providers' service areas. This data can then be used to calculate an average bill for each service area.

Unlike electric providers, which report their revenues and customer counts across the entire state, natural gas providers are required to provide their data for each of their individual service areas. For this reason, the average bill for each service area should be very accurate, since the geographic coverage of each service area is relatively small.

After compiling the average monthly bill for each service area, these values were allocated to the school districts covered by each area as was done for both electric and telephone providers. Again, in areas where multiple providers serve a single school district, a weighted average based on population size covered was used to calculate the rate to be assigned to each district.

One unique aspect of determining an average bill for natural gas across the state is that some school districts depend on propane for their heating needs rather than natural gas. While it is possible to gather information on propane *prices* around the state, propane providers do not have an accurate measurement of

the actual propane *usage* in their area. Trying to estimate the true cost of propane service based on some estimated usage value, therefore, would likely be very inaccurate. Instead, Corona used data from the Energy Information Administration to calculate the relative cost of using propane for energy instead of natural gas, based on the actual energy output for each fuel in BTU's and the 2010 average cost for each fuel in Colorado.

After determining this "conversion factor," the cost of propane service for each school district without natural gas service was computed by averaging the natural gas bills of the surrounding districts and inflating that average based on the analysis discussed above. This methodology was consistent with the methodology used in the 2007 study and this analysis should yield a far more robust analysis than simply estimating the usage in each area arbitrarily.

HOUSING – UTILITIES – TELEPHONE

In order to calculate the average monthly telephone bill for residents around the state, Corona obtained telephone rates from the Public Utilities Commission's "2010 ILEC Annual Report." This report detailed the monthly base rates being charged by each "incumbent local exchange carrier" around the state. Each provider charges the same rate throughout their service area, with the exception of CenturyTel. In this case, each of CenturyTel's rate areas was considered to be a separate provider for the purposes of computing an average bill.

Similar to the process used for electric providers, these rates were assigned to each of the school districts based on the providers' coverage areas. In areas where multiple providers serve a single school district, a weighted average based on population size covered was used to calculate the rate to be assigned to each district.

In addition to the base rates being charged by each company, a variety of other fees contribute to the total monthly bill in an area. First, a number of fees are assessed on telephone bills across the entire state. Specifically, the high cost surcharge, hearing impaired relay fund, low income surcharge, and subscriber line charges are the same across the entire state. Similarly, all applicable utility taxes were applied to all districts. Other charges, such as the 911 surcharge, vary from one area of the state to another. These charges were, therefore, applied on a district-by-district basis to calculate the overall average bill.

HOUSING – UTILITIES – WATER/SEWER

In order to determine the average monthly payments for water and sewer bills in each school district, Corona Insights collected rate information for 256 cities and towns throughout the state. The data collection was initiated by using a spreadsheet that held contact data and information from similar research performed in 2007. Corona employees attempted to collect data from each of the 256 agencies; most of the information was collected via phone calls, although rates for some towns were found online. Phone calls proved to be the fastest source of information in most cases. In the event that no contact information could be found, or if a town used only wells or septic tanks, proxy values were used based on rates charged in the nearest town.

After data collection was complete, equations for determining monthly totals were written into the spreadsheet for each of the 256 towns. The equations figured rate totals based on a home that uses 6,000 gallons of water per month, and produces 6,000 gallons of wastewater for processing per month. These totals were then applied to the appropriate school districts. In some cases, rates had only been researched for one town within a district; in these cases, that rate was simply applied to the entire district. Other school districts were host to multiple towns, and data had been collected from several towns within the district. In those cases, each rate was weighted according to population so that a more accurate value for each district could be determined.

Average day care costs (by Colorado County) were obtained from the 2011 Market Rate Survey of Child Care Providers which is conducted by Qualistar Colorado. Qualistar Colorado is the result of a merger that occurred in 2004 between two early education non-profit organizations based in Colorado – Educare Colorado and the Colorado Office of Resource and Referral Agencies (CORRA). Qualistar is under contract to the Colorado Department of Human Services, Division of Child Care as the State Resource and Referral Agency. As part of this contract they conduct this bi-yearly market research study of state-wide day care costs.

Included in the Market Rate Survey of Child Care Providers are costs for licensed child care centers (CCC), family child care providers (FCC), and school-age child care (SACC) facilities in all 64 counties. Full-time weekly rates of caring for children between 0 to 12 months, 1 to 2 years, and 2 to 5 years were provided in Qualistar's 2011 report.

In determining the average weekly costs for childcare services, the average of child care centers (CCC's) and family care centers (FCC's) for all age groups provided, 0 to 12 months, 1 to 2 years, and 2 to 5 years, was calculated. The averages were then weighted based on the national proportion of children in either "Center" or "Family" day care. These proportions were on based three sources: (1) U.S. Census Bureau population counts of Colorado children in each age group, (2) the total percentage of kids 0-5 years in daycare from ChildStats.gov (Fam3a Table, Western States, from U.S. Census Bureau, Survey of Income and Program Participation, 2010) http://www.childstats.gov/americaschildren/tables/fam3a.asp, and (3) the proportion of day care children from each age group (0-12, 1-2 years, and 2-5 years) from the FFY 2009 CCDF Data Tables, U.S. Department of Health and Human Services, Administration for Children & Families, data for State of Colorado, children in CCDF-funded programs. http://www.acf.hhs.gov/programs/occ/data/ccdf_data/09acf800_preliminary/table9.htm.

Weekly rates were then converted to a monthly cost by multiplying the weekly cost of care by 52 weeks per year and then dividing it by 12. Final district average day care costs were then reallocated from the county level to the final district level.

TRANSPORTATION – VEHICLE PAYMENTS

Vehicle pricing was gathered for a 2009 Honda Civic LX Sedan. The purchase price of the 2009 Honda Civic was $15,626 (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 insures 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.

Financing rates for vehicle loans were obtained from telephone surveys of banking institutions and credit unions throughout the state. The list of banking institutions to survey came from information provided by the Federal Deposit Insurance Corporation (FDIC) and National Credit Union Administration (NCUA) which provided market share information for the institutions. This data was gathered on a county basis and then mapped to the district level to obtain the rate for each district. Average monthly car payments were then calculated, 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.

Insurance companies with a large market share for vehicle insurance in Colorado were determined by analyzing the 2008 "Annual Report of the Commissioner of Insurance" These companies were contacted to determine vehicle insurance rates by zip code.

For vehicle insurance, two vehicles were used to calculate rates. The first vehicle was a 2009 Honda Civic LX sedan with a four cylinder 1.8 liter engine, five speed manual transmission, 24,000 miles, air conditioning, power steering, power windows, power locks, tilt, cruise control, AM/FM CD, and dual airbags. The coverage was comprehensive with liability policy limits of $25,000/$50,000/$15,000 with a $250 deductible and 15,000 miles per year. The second vehicle was a 2007 Ford Ranger XL long bed pickup with a 4.0 liter V6 engine, 5 speed manual transmission with two wheel drive, 60,000 miles, air conditioning, power steering, cruise control, AM/FM CD, and airbags. The coverage was liability only with liability policy limits of $25,000/$50,000/$15,000 with 15,000 miles per year. These two cars are similar to the ones used in previous studies and represent highly popular makes and models. The model year was updated from the previous study so that the vehicles are always 2 years old and 4 years old, and some features have to be adjusted accordingly.

For each car and across each zip code, the driver's characteristics were held constant. The driver was assumed to be a thirty year old married man with good credit and a good driving record. The particular characteristics of the driver were not vitally important because the comparison of the rates were done using ratios, and as long as the driver's information was held constant by each insurance company, the utilization of the ratio method can be assumed to be a valid method of comparison. Data was given for six months, so the total of the two vehicle's insurance was summed and multiplied by two to get the yearly rate for both cars.

As previously detailed in the main body of the report, vehicle insurance data was obtained from one vehicle insurance provider that has a large share of the vehicle insurance market in Colorado. The name of that company will not be provided in this report in order to ensure pricing confidentiality to that company. Vehicle insurance rates were provided from the participating vehicle insurance company for each vehicle by zip code. Once the zip codes for each county were determined, the rates for each zip code were averaged for each county and then were redistributed to the proper school district as final vehicle insurance rates.

HEALTH CARE

In order to determine the average monthly health insurance premium rate in each school district, Corona Insights collected rate information from four of the largest health insurance providers in the state. Data were collected for PPO's from three of the companies, and an HMO from the remaining provider. Using each insurance provider's website, Corona employees gathered rates as they would apply to a family of three, all non-smokers, and in good health. The family of three was described as:

⇨ 1 Male, 37, DOB 6/20/1974;

⇨ 1 Female, 36, DOB 2/4/1975; and

⇨ 1 Male, 4, DOB 4/5/2007.

Most of the websites determined rates based on location within the state as indicated by county or zip code. In the cases when a zip code was required, the code from the applicable county seat was used.

Rates for the two most popular plans for each of the four participating companies were obtained. Corona project staff consulted with representatives from each of the four companies to select the final plans that were used from each company. The plans are not necessarily comparable between all companies because

benefits varied widely among the providers. In addition to recording plan rates, Corona employees also noted the benefits provided by each plan.

Average health insurance costs were averaged for each of the four companies (between the two most popular plans) and then final health care costs were calculated by multiplying these final company averages by the weighted (comparative) average market share of each company to obtain final costs by zip code. The costs collected for each zip code were then applied to school districts within each county.

PERSONAL (INCOME) TAXES

Personal income taxes were calculated for the benchmark family in each district using the IRS Form 1040 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 and property taxes, 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 are 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 are calculated from the formulas in publication, DR 1098 "Colorado Income Tax Withholding Tables for Employers".

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 2011 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 divvied across the districts came directly from the benchmark families spending level calculated for each category from the *Consumer Expenditure Survey.*

APPENDIX C: NOTABLE METHODOLOGICAL CHANGES FROM THE 2009 COST OF LIVING STUDY

A few notable methodological changes were implemented between the 2009 and 2011 Cost of Living Reports. In the opinion of the research team, each of these changes had a positive impact on the quality of the data.

CHANGES TO THE MARKET BASKET

Minor changes were made to a few of the goods included in the market basket. These changes are detailed below:

⇨ **Mattress changed to Refrigerator.** In previous years, mattress prices were used to represent the Household Furnishings and Equipment category. Again this year, mattress prices were collected in-person throughout the school districts, however based on feedback from data collectors, and an assessment of the data collected for this item, it was determined that comparable mattress items were unable to be priced across stores and districts. Mattress manufacturers have begun to sell different lines to different stores, with a plethora of features and names making it very challenging, if not impossible, to ensure that we were gathering prices that only reflected variance in the local market, and not variance in item quality. Corona researched a variety of replacement items in an attempt to identify an item that could be well-specified and where the exact item was likely to be available across stores and across districts. Ultimately, it was determined that the most reliably available item across stores at the present time was a stainless-steel side-by-side refrigerator. Then a standard size was selected by examining all of the sizes manufactured by the major suppliers to identify a size that was common to most brands.

⇨ **DVD Player changed to TV.** The electronics market has rapid turnover in available technology. Prior to 2007, the entertainment category was represented by a then-standard television model, but in 2007, flat screen TVs were becoming available, and it had become difficult to find a commonly available television model. In 2007, we began pricing a DVD Player that was commonly available. However, by 2011, DVD Players were being taken over by Blu-Ray players and a commonly available model of DVD Player was difficult to identify. So, in 2011 we returned to a television set item, and identified a now-common flat screen LCD TV with a set of features produced by most manufacturers, and widely available across stores. Because this cost of living index is a point-in-time snapshot of differences across school districts, the most critical need is to be able to price identical or near-identical items in each district (as opposed to pricing the same item over time). The electronics item is likely to need regular updating to ensure a currently popular item that will be available widely.

⇨ **Home Maintenance Item Eliminated.** The subcategory of Shelter that is defined as "Maintenance, Repairs, Insurance, Other Expenses" has been represented by two items in previous years: Homeowner's Insurance and Home Maintenance Expenses. Home maintenance was calculated using the U.S. Census Bureau's Survey of Residential Alterations and Repairs (SORAR), which was discontinued as of 2007. The 2006 data had been used for the 2007 index, so in 2009, we used the 2007 data. In 2011, because a replacement data source was not available, we have instead let Homeowner's Insurance stand in for the whole category. The "Maintenance, Repairs, Insurance, Other Expenses" category currently accounts for only 1.83 percent of total expenditures, so it is reasonable to have a single item represent the category.

CHANGES TO THE SHOPPING PATTERNS SURVEY

⇨ **Multiple Survey Modes Explored.** The political boundaries of school districts within the Colorado Springs metropolitan area make it difficult to determine during telephone interviews which of the metro districts people are shopping in. To overcome this difficulty, a paper version of the shopping patterns survey was developed for the Colorado Springs area that included a map of the area with major roads and school district boundaries identified as "zones". Respondents were asked to indicate the zone in which they shopped for each item.

⇨ **Modeling Simplified.** After three cycles of conducting the shopping patterns survey, significant data exists for most districts, with 144 of 178 districts having sufficient data to use exclusively in defining shopping patterns. In the other 34, available data were weighted with responses from adjacent districts, which represents a simpler model than that used in previous cycles. The volume of data now gathered across the state allowed this simplification.

⇨ **Question Categories Updated.** Some question categories were updated to allow for changes to market basket items. For example, instead of asking specifically about a DVD player, we asked about a TV, and instead of asking about a mattress, we now ask about "a major furniture item, mattress, or appliance". In addition, car purchase location was eliminated from the survey because the car price is held constant across districts using the Kelley Blue Book price, and vehicle payments are calculated instead using bank rates available from the district. Pet food purchase location was also eliminated from the survey because many households do not buy pet food and those who do were typically purchasing it at the same location as other non-perishable groceries.

⇨ **Housing Questions Added.** To explore possible alternative methods for calculating the price of housing in each district, in 2011 a series of housing questions was added to the survey. Respondents were asked whether they rent or own their home, the type of property, the number of bedrooms, the amount of monthly rent (for renters), any utilities or amenities included in the rent, and the amount of estimated rent that could be charged to rent out the property (for owners). In addition, respondents were asked two questions to assess the quality of the location of their home. This is similar to the data collected by the Bureau of Labor Statistics to determine housing expenditures, and allows for calculating a "rental equivalence" housing value.

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

Good evening. My name is _____ and I am calling to conduct a 7-minute survey about where people shop. May I begin?

FILTER QUESTIONS

1. First, may I ask your age? _____ (IF AGE IS >18 SKIP TO Q_2)

    □___ Refused 999 **[IF RESPONDENT REFUSES TO ANSWER, ASK Q1a]**

    Q1a Are you 18 years old or older?

    __ YES (1) **[SKIP TO Q2]**
    __ NO (2) **[ASK Q1b]**

    Q1b. Is there an adult over 18 years of age or older in the household that I could speak with?

    __ YES (1) **[RETURN TO INTRO AND Q_1]**
    __ NO (2) **[THANK AND TERMINATE]**

2. Are you a Colorado resident?

    __ YES (1) **[CONTINUE**]
    __ NO (2) **[THANK & TERMINATE]**

    Q2a Can you please tell me the name of the town in Colorado where you currently live?

    ___□ Does not live in a town **[SELECT FROM DROP DOWN BOX "DO NOT LIVE IN A TOWN" ASK Q2b]**

    ___□ Lives in a town **[SELECT TOWN FROM DROP DOWN BOX AND SKIP TO Q2c]**

    ___Other town **[ASK Q2a_other, THEN SKIP TO Q2c]**

    Q2a_other _____

    Q2b What is the name of the closest town in Colorado to where you live? _____ **[SELECT TOWN FROM DROP DOWN BOX]**

    Q2c What county do you live in? **[DO NOT READ RESPONSES, SELECT ONE COUNTY FROM DROP DOWN BOX]**

    Q2d And just so we can more precisely map responses, what is your Zip Code? _____

3. **Q3a** Do you know what school district you live in? We're not talking about specific schools, but rather the whole school district.

1 Yes (What is it? **Q3b**_____) [Note that many school districts have similar names, so be sure to confirm if there are two that are close in name.]

2 No [I'm going to name some school districts near where you live; please tell me if you recognize the name of your school district. If you're not sure, you can say "not sure". **READ POSSIBLE OPTIONS FROM LIST (in NeighboringDistricts.xls) THE SAMPLE HAS A SCHOOL DISTRICT IDENTIFIED FOR EACH PERSON, NAME THAT DISTRICT, THEN NAME ITS NEIGHBORS FROM THE LIST, IF DISTRICT IS RECOGNIZED, ENTER IT IN Q3b**_____]

SHOPPING LOCATIONS

I'm going to read you a list of 12 items, and please tell me the name of the city or town where you or a member of your household last purchased each item. Please be as specific as possible about the city or town where you last purchased each item, for example, if you purchased the item in Centennial, say Centennial rather than Denver. If the last time you purchased the item was when you were traveling away from home, please tell us where you last purchased the item when <u>not</u> traveling. Also, if your last purchase of that item was online using a computer, you can answer "online".

4a. <u>Non-perishable groceries such as canned goods</u>

Select city from drop down list **[Codes 3-653]**
[IF METRO DISTRICT ASK Q_5a MILEAGE]
[IF CODE 159 DENVER METRO ASK Q4a_1]
[IF CODE 654 "OTHER CITY" ASK Q_4a_other]
Purchased Online **[Code 1 SKIP TO Q_4B]**
Never buys Item **[Code 2 SKIP TO Q_4B]**

4a_other.   **Q4a_other** _____

4a_1. "Do you mean the City of Denver or another city in the Denver metro area?

1 The city of Denver **[IF CITY OF DENVER ASK Q5a MILEAGE]**

2 Another city in metro area **[SELECT CITY FROM DROP DOWN BOX, IF METRO DISTRICT ASK Q5a MILEAGE]**

Q5a. About how many miles from your home did you buy this item? _____Please make your best guess if you're not sure.

4b. <u>Fruits, vegetables, or other produce</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5b MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4b_other]
Purchased Online **[Code 1 SKIP TO Q4c]**
Never buys Item **[Code 2 SKIP TO Q4c]**

4b_other. **Q_4b_other** _____

5b. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4c. <u>Perishable groceries such as milk, meat or ice cream</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5c MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4c_other]
Purchased Online **[Code 1 SKIP TO Q4d]**
Never buys Item **[Code 2 SKIP TO Q4d]**

4c_other: **Q_4c_other** _____

5c. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4d. <u>Household products such as laundry soap, batteries, or toothpaste</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5d MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4d_other]
Purchased Online **[Code 1 SKIP TO Q4e]**
Never buys Item **[Code 2 SKIP TO Q4e]**

4d_other **Q_4d_other** _____

5d. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4e. <u>Meal at a restaurant</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5e MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4e_other]
Never buys Item **[Code 2 SKIP TO Q4f]**

4e_other **Q_4e_other** _____

5e. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4f. <u>Alcoholic beverages purchased to drink at home (not at a bar or restaurant)</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5f MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4f_other]
Purchased Online **[Code 1 SKIP TO Q4g]**
Never buys Item **[Code 2 SKIP TO Q4g]**

4f_other **Q_4f_other** _____

5f. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4g. <u>**Clothes or shoes**</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5g MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4g_other]
Purchased Online **[Code 1 SKIP TO Q4h]**
Never buys Item **[Code 2 SKIP TO Q4h]**

4g_other **Q_4g_other** _____

5g. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4h. <u>**Gasoline**</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5h MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4h_other]
Never buys Item **[Code 2 SKIP TO Q4i]**

4h_other **Q_4h_other** _____

5h. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4i. <u>**Car maintenance and repair services**</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5i MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4i_other]
Never buys Item **[Code 2 SKIP TO Q4j]**

4i_other **Q_4i_other** _____

5i. About how many miles from your home did you buy this item? _____ Please make your best guess if you're not sure.

4j. <u>**Regardless of how you bought the tickets, in what town or city did you most recently see a movie in a theater?**</u>

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5j MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4j_other]
Never buys Item **[Code 2 SKIP TO Q4k]**

4j_other **Q_4j_other** _____

5j. About how many miles from your home did you buy this item? _____Please make your best guess if you're not sure.

4k. Haircut

Select city from drop down list **[Codes 3-653]**
IF METRO DISTRICT ASK Q5k MILEAGE]
[IF CODE 654 "OTHER CITY" ASK Q4k_other]
Never buys Item **[Code 2 SKIP TO Q4l]**

4k_other **Q_4k_other** _____

5k. About how many miles from your home did you buy this item? _____Please make your best guess if you're not sure.

We're almost done. My last questions are about three less frequent purchases.

6a. Have you purchased a major furniture item, mattress or appliance in the past 3 years?

YES **[ASK Q7b]**
NO **[SKIP TO Q7d]**
DON'T KNOW **[SKIP TO Q7d]**

6b. Were you living in your current community when you bought it?

YES **[ASK Q7c]**
NO **[SKIP TO Q7d]**
DON'T KNOW **[SKIP TO Q7d]**

6c. In what city did you purchase the item? You can answer "online" if you bought the item on a computer

Select city from drop down list **[SELECT Codes 3-653, Then SKIP TO Q7a]**
[IF CODE 654 "OTHER CITY" ASK Q6c_other]
Purchased Online **[Code 1 SKIP TO Q7a]**

6c_other: **Q6c_other** _____ **[SKIP TO Q7a]**

6d. What town or city do you think you would go to if you were going to buy a mattress tomorrow?

Select city from drop down list **[Codes 3-653, Then GO TO Q7a]**
[IF CODE 654 "OTHER CITY" ASK Q6d_other]
Purchased Online **[Code 1 Then GO TO q7a]**

6d_other: **Q6d_other** _____

7a. Have you purchased a television in the past 3 years?

YES **[ASK Q7b]**
NO **[SKIP TO Q7d]**
DON'T KNOW **[SKIP TO Q7d]**

7b. Were you living in your current community when you bought it?

YES **[ASK Q7c]**
NO **[SKIP TO Q7d]**
DON'T KNOW **[SKIP TO Q7d]**

7c. In what city did you purchase the item? You can answer "online" if you bought the item on a computer

Select city from drop down list **[SELECT Codes 3-653, Then SKIP TO Q8]**
[IF CODE 654 "OTHER CITY" ASK Q7c_other]
Purchased Online **[Code 1 SKIP TO Q8]**

7c_other: **Q7c_other** _____ **[SKIP TO Q8]**

7d. What town or city do you think you would go to if you were going to buy a DVD player tomorrow?

Select city from drop down list **[Codes 3-653, Then GO TO Q8]**
[IF CODE 654 "OTHER CITY" ASK Q7d_other]
Purchased Online **[Code 1 Then GO TO Q8]**

7d_other: **Q7d_other** _____

We're almost done. Now I just have a few questions about housing prices and locations.

8.   Do you rent or own your home?

___ Own
___ Rent
___ Other/Don't Know

9. Which of the following best describes your home?

___Single family home, not attached to other units
___Part of a 2, 3, or 4-unit structure
___In a building with 5 to 19 housing units,
___In a building with 20 or more units.
___Some other type of housing unit

10. How many bedrooms are in your home? _____ (If it's a studio or buffet unit, record "zero" bedrooms.)

11a. [If Rent] What is the total monthly rental cost of your home? Count the whole cost, even if you split it with roommates. _____

11b. [If Rent] Does the rental cost include any of the following? You can answer yes or no for each.

___Cable or Satellite TV
___Electricity

___Gas
___Internet
___Sewer
___Trash
___Water

11c. [If Own] If you were renting your home instead of owning it, how much do you think it would cost in monthly rent? [If asked, assume that no utilities would be included.]

12. Assume that you meet a person who is planning to move to Colorado. They can do their job anywhere and cost of living isn't a concern to them. Would you recommend that they move to your local area, or would you recommend a different place in Colorado?

___Their Location
___Different Location
___Neither/Refused/Don't Know

13. On a scale from 1 to 10, assume that 10 represents an ideal place for you to live, and 1 represents a terrible place for you to live. 5 is average. How would you rate where you currently live? _____ [If asked, we're asking about the community and location of the house, not the house itself.]

14. GENDER [RECORD BY OBSERVATION IF POSSIBLE.]

1 Male

2 Female

Thank you. We appreciate your time.

APPENDIX F: GEOGRAPHIC SHOPPING MATRICES

Appendix F provides two volumes of information. First, this appendix provides additional detail about the methodology used to define geographic shopping patterns. Second, the actual matrices are presented.

ANALYSIS OF GEOGRAPHIC SHOPPING PATTERNS

Because residents often leave their school district to make purchases, and because prices often vary across district boundaries, it is necessary to understand the geographic shopping patterns of each school district in order to develop the actual cost of living in each district.

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. For the 2007 study, Corona Insights was asked to update the analysis of geographic shopping patterns. In 2007, Corona began implementing a more global long-term system of updating shopping patterns, the implementation of which continued into 2009 and 2011, and will likely be complete and mature in approximately 2015.

Ideally, updating the analysis of geographic shopping patterns would involve conducting statistically robust surveys in each and every school district, which would determine geographic shopping patterns for each product in the market basket. However, the large number of school districts in the state means that this approach is not feasible, as the cost to do so would have been quite high.

THE SHOPPING PATTERNS SURVEY

In the 2011 Cost of Living study, Corona Insights continued their long-term approach to update and enhance the data collected for the shopping patterns matrix. The research team designed a survey that asked about geographic purchasing patterns for 13 types of products. For 11 categories of small products, 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 metro areas were asked about both the town and the distance that they traveled. For products commonly sold online, respondents were also allowed to state that they bought the product online. Respondents were also allowed to state that they never buy the product.)

The eleven small product categories were:

- Non-perishable groceries such as canned goods
- Fruits, vegetables, or other produce
- Perishable groceries such as milk or ice cream
- Household products such as laundry soap, batteries, or toothpaste
- A meal at a restaurant
- Alcoholic beverages that were purchased to drink at home (not at a bar or restaurant)
- Clothes or shoes
- Gasoline
- Car maintenance and repair services
- Movie tickets at a theater

- Haircut

For the two larger products, respondents were asked if they had purchased the item in the past 3 years; and if so, whether they were living in their current community when they bought each one. They were then asked what city they purchased any such items in (which could included "online" if they bought the item on a computer). If they had not purchased the item recently while living in their current community, they were asked what town or city they thought they would go to if they were going to buy these items tomorrow. The two large products were:

- Major furniture item, mattress, or appliance
- Television

The larger 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.

The survey is conducted by telephone for all parts of the state except Colorado Springs and nearby districts. In 2011, those areas shifted from a telephone survey to a mailed survey, for reasons described below.

ANALYSIS AND MODELING

One of two methods were used to assess geographic shopping patterns within a district, with some variations within each method.

The most favored method was to simply analyze the surveys available by residents within a district, and use that data directly. Surveys are combined over years, with the 2007, 2009, and 2011 surveys currently being combined. After examining the data, Corona determined that any district with at least 30 responses offered enough data to develop shopping patterns for those residents. While the margin of error is relatively large, this number of responses appears to represent global patterns well, based on inspection of the data, with enough responses to identify shopping destinations with less than a ten percent market share.

144 of the 178 districts met this threshold, and shopping patterns were based exclusively on the collected survey data, with the following exception. In the other 34 counties a weighted model was used that combined any surveys that had been collected with combined data from adjacent districts. The weighting of the two elements was straightforward: the survey data was weighted as the number of completed surveys divided by 30 (minimum number of surveys required to eliminate modeling), and the analysis of adjacent districts represented the remainder. In 26 districts the district-specific surveys were weighted at more than 50 percent of the total, and in eight districts the adjacent district figures were weighted at more than 50 percent of the total.

One challenge in the shopping patterns analysis is the presence of several school districts in Colorado Springs. For residents of the city and surrounding areas, stating that a purchase was made in Colorado Springs does not delineate a specific district. To resolve this challenge, Corona changed the format of the survey in those areas to a mailed survey from a telephone survey. With this system, respondents were given a map and asked to mark the zone of the city in which they had purchased each product, or to write a city if it was outside the Colorado Springs area.

In most cases, shopping patterns appeared logical – people shopped in their district or a nearby district, and occasionally shopped in larger communities that were more distant. Those patterns were acknowledged

in the data. Outliers were labeled in instances where purchases were made roughly 100 miles or more distant, and where the resident would have passed through a larger community to reach the stated shopping destination. (For example, a resident in Burlington RE-4J district states that they purchased produce in Steamboat Springs RE-2.) In these instances, the research team acknowledged that residents of districts may travel outside their district more and shop in seemingly random locations on occasion, but that the actual location would likely vary each time the survey is conducted. As a solution, these observations were counted as "Colorado Distant" destinations, and statewide average pricing was used instead of the destination's pricing.

GEOGRAPHIC SHOPPING MATRICES

The following tables show the relationships between geographic areas and the shopping patterns of residents. In the tables, each row represents a district and a product category, and each column represents the proportion of shopping that occurs in a particular region. Therefore, each row adds up to 100 percent of the shopping for a particular product category in a particular district.

As previously described, these tables are based on a variety of modeling methods, survey data, and geographic data. As such, the rows represent predominant areas of shopping and are not intended to model every potential shopping trip. The goal was to develop major patterns sufficient to develop cost estimates for products.

Readers receiving this report electronically will need to review an accompanying spreadsheet file, due to the volume of data.

APPENDIX G: STATISTICAL MEASURES USED IN THIS REPORT

Mirroring the statistical review process used in the 2007 study, in 2009 the research team evaluated the method of calculating confidence intervals of cost of living indices as outlined in the document "Statistical Methodology 2005 Colorado School District Cost of Living Study," by Thomas Bengtsson. 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:

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

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_L 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_L are considered in the Bengtsson treatment.

The Bengtsson derivations for the propagation of μ_L 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.

TABLE G-1: 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 careful outlier detection process, as was implemented in the 2007 study and used in the current 2009 study. 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 n approaches 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 size 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 groups. However, reliable collection of such data is probably impossible.

What are the limitations of the methodology used to calculate the confidence intervals of the COL indices? One of the major limitations of the methodology 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 may appear to be unacceptably large to the client 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_L by a shopping survey of a subset n of the stores. We also calculate the variance of the sample σ_L from the sample data. The *variance of the estimate of* μ_L 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_L increases. We account for this effect on σ_L^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):

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

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

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

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:

$$\sigma^2_{S\mu} = S'\sigma^2_\mu S$$

Where σ^2_μ and $\sigma^2_{S\mu}$ are square matrices with the elements of interest on the diagonals.

The state-average price is given by:

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

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

$$\sigma^2_{SS} = \left(\frac{\partial\mu_{SS}}{\partial\mu_{D1}}\right)^2 \sigma^2_{\mu1} + \left(\frac{\partial\mu_{SS}}{\partial\mu_{D2}}\right)^2 \sigma^2_{\mu2} + \left(\frac{\partial\mu_{SS}}{\partial\mu_{D3}}\right)^2 \sigma^2_{\mu3}$$
$$= (p_1 S_{11} + p_2 S_{21})^2 \sigma^2_{\mu1} + (p_1 S_{12} + p_2 S_{22})^2 \sigma^2_{\mu2} + (p_1 S_{13} + p_2 S_{23})^2 \sigma^2_{\mu3}$$

This corresponds to the vector notation:

$$\sigma^2_{SS} = p'S'\sigma^2_\mu Sp \qquad \leftarrow \text{imagine this in bold}$$

The *COL* is a weighted function of the ratios $r_D = \mu_{SD}/\mu_{SS}$. Now for district 1 we calculate the variance σ^2_{r1} 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 $\sigma^2_{S\mu1}$ and σ^2_{SS} respectively:

$$\sigma^2_{r1} = \left(\frac{\partial r_D}{\partial\mu_{SD1}}\right)^2 \sigma^2_{S\mu1} + \left(\frac{\partial r_D}{\partial\mu_{SS}}\right)^2 \sigma^2_{SS}$$
$$= \frac{1}{\mu^2_{SS}}\sigma^2_{S\mu1} + \frac{\mu^2_{SD1}}{\mu^4_{SS}}\sigma^2_{SS} = \frac{1}{\mu^2_{SS}}\left(\sigma^2_{S\mu1} + r^2_{D1}\sigma^2_{SS}\right)$$

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:

$$\sigma^2_{COL} = \sum w^2_i \sigma^2_{ri}$$