

Alberta Spatial Price Index Program – 2016 Reference Year

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1 Introduction

In collaboration with the Government of Alberta, The Centre for Innovation Studies (THECiS) requested the Government Allowances and Spatial Price Indexes (GovAll) section of the Consumer Prices Division (CPD) at Statistics Canada to conduct the Alberta Spatial Price Index (ASPI) survey in 2016. Information gathered through this survey would be used to estimate various spatial consumer price indexes for 35 communities located throughout Alberta, including Edmonton as the reference location (see Appendix 1 for a complete list of communities surveyed). The 2016 iteration of the ASPI marked the first time GovAll conducted such a survey for Alberta; previous survey iterations were conducted by the Government of Alberta.

This report is comprised of five sections:

1. Introduction
2. Sampling
3. Data collection
4. Data processing
5. Concept and methodology
6. Limitations of results.

2 Sampling

The original list of products (both goods and services) considered for the 2016 iteration of the ASPI survey was derived from the list of products selected for the survey in 2010. Many of the products selected for the 2010 iteration were chosen again for the 2016 reference year (see Appendix 2 for the full product list used in 2016); however, there were 39 products – belonging to 12 of the 17 product categories – that were included in 2010 but not in 2016 (see Appendix 3 for the exclusion list).

Knowledge of the retail outlets present in each community, based on Internet research, was the basis for outlet selection. The sampling method can be described as a judgmental sampling approach.

The 2016 ASPI survey was conducted at the same time as Statistics Canada's Living Cost Differential (LCD) Survey in Alberta Isolated Posts. The LCD survey is conducted every 4 years in support of the Isolated Post and Government Housing Directive of the National Joint Council. In 2016, 21 Isolated Posts in Alberta were included in the LCD Survey, ten (10) of which were also included in the ASPI survey sample (see Appendix 1).

Not all of the products included in the LCD Survey were included in the ASPI survey. Likewise, the ASPI survey included some products not included in the LCD Survey. The ASPI survey included a total of 389 varieties of among 172 products (see Appendix 2), constituting a subset of the basket of goods and services used for Statistics Canada's Consumer Price Index (CPI) program.

3 Data collection

Price collection for the ASPI series employed two pricing schedules: the main and the supplementary pricing schedules. The former is essentially the same pricing schedule used by the GovAll section of CPD to collect prices for its "Isolated Posts Price Indexes" program. The supplementary pricing schedule was designed for household equipment products not included in the main pricing schedule but deemed necessary to ensure adequate coverage for the ASPI survey.

Prices were collected by Statistics Canada field interviewers through: personal visits to retail outlets in each community; from secondary data sources available on the Internet or over the telephone by staff in the GovAll section of CPD; or from the Government of Alberta. These secondary data sources are described below.

3.1 House purchase

The Government of Alberta's Office of Statistics and Information (OSI) provided house price data by community (including Edmonton), compiled by a realtor deemed to have substantial experience in residential real estate. House prices of bungalows and multi-level building structures in each community were matched to house prices in Edmonton based on criteria such as age of the house, square footage, number of bedrooms, whether there was an attached or unattached garage, and whether the basement was finished. In some cases, however, matching of homes between the community and Edmonton was limited as the pool of real estate transactions was restricted to those that took place in the three (3) months immediately prior to the main field data collection in March. Ultimately, homes in 30 of the communities met all matching criteria to homes in Edmonton, with four communities matching some but not all criteria.

3.2 Property tax

Property taxes were estimated using mill rates collected from each community's municipal government website. These mill rates were applied to the selling prices of comparable houses in a given community and Edmonton before property tax differentials were estimated. In cases where a satisfactory match for houses between the community and Edmonton was difficult to obtain, differentials in property taxes will reflect, to some extent, this limitation.

3.3 Rent

OSI provided the GovAll section 2016 data for tenant-occupied rental units in the smaller communities surveyed. The data were collected by the Alberta Ministry of Seniors between May and August 2016 as part of its annual Rural Apartment Vacancy and Rental Cost survey program. For the larger communities, rents were projected for 2016 based on Canada Mortgage and Housing Corporation (CHMC) outlook data. Rental cost ratios between Edmonton and each community were calculated for comparable building structures.

3.4 Electricity, water, sewer and gas rates

Prices for electricity, water, sewers and gas vary by location according to the local service provider. Monthly electricity bills (flat, variable rates, rider fees) were calculated and compared for an identical consumption rate.

Water consumption and sewer fees were collected from each community's website by employees in the GovAll section. The rate assigned to specific consumption amounts in each community were matched to identical consumption amounts and corresponding rates in Edmonton to compute price ratios between Edmonton and the community.

3.5 Mortgage interest

Geographical cost differentials of owned accommodation (for the consumption part of owning and living in a house as opposed to its investment/savings part) were calculated using a monthly mortgage interest payment and the first-month amortized segment of a mortgage loan for selling prices of comparable houses between Edmonton and each community. For the ASPI survey, the amortization period of the mortgage loans was set at 25 years and the down payment of the loan was assumed to be 10 per cent of the house selling price.

Mortgage interest rates were calculated in each community by taking an average of posted regular interest rates for a 5-year fixed-term mortgage of financial institutions with physical presence in the community. Special rates or introductory offers, targeted at first-time home buyers, were excluded. Regular mortgage interest rates varied across communities from a low of 4.04 per cent to a high of 4.77 per cent, with the base city, Edmonton, at 4.33 per cent.

3.6 Daycare

Prices for child daycare centres were collected, for the most part by telephone and to some extent via the Internet by GovAll section staff. In most of the communities, daycare fees were monthly; however, some provided daily fees. The fees used in this project are those for a 4-year old child. Both daily and monthly daycare fees were collected in Edmonton to enable matching between Edmonton and a community.

3.7 Car rental

Rental car fees at major car rental companies were collected from the Internet by GovAll section staff for communities where the service was available. For communities that did not have rental car outlets, prices were imputed from the nearest location.

3.8 Driving lessons

Driving lesson fees for 15 hours of in-class training and 10 hours of in-car training were collected from the Internet from driving schools with certified drivers' training programs.

3.9 Medical services

Chiropractic service rates were collected by telephone by GovAll section staff. The price pertained to a visit following an initial assessment for a lower back adjustment.

Dental services were for a standard service and an amalgam filling or equivalent white filling listed under a specific dental service number.

For veterinary services, prices were collected over the phone by GovAll section staff for an annual health examination of a dog, plus standard vaccines.

3.10 Vehicle and home insurance

Vehicle and home insurance premiums were extracted from a database of insurance service provider rates. A model-pricing approach was applied with home insurance premiums collected for both homeowners and tenants, and vehicle insurance premiums collected for three different vehicles, each with two different personal profiles, i.e., male and female drivers.

3.11 Cable, Internet and telephone services

Cable television, Internet and telephone services fees were collected directly from major service providers' websites by GovAll section staff. Each community had at least one service available provider for Internet and telephone services, while some communities had a choice of two or more service providers for cable television services.

3.12 Fitness membership fees

Monthly membership fees to fitness centres were collected from the Internet and through telephone calls by GovAll section staff. For communities for which data could not be collected, fees were imputed from similar services in proximate locations.

3.13 Clothing

Garments and other items of clothing are highly heterogeneous, rendering it impossible to match identical varieties among the surveyed communities. As a result, price imputations were based on the results of the 2010 iteration of the ASPI survey.

3.14 Vehicle purchase and lease

Prices for purchase of vehicles and car lease rates could not be collected from the Internet. Therefore, ratios were imputed directly from the 2010 iteration of the ASPI survey.

4 Data processing

Collected data were keyed into a Microsoft Excel spreadsheet for data cleaning, verification and analysis.

Each product variety with a valid price in each community was matched to an identical or near-identical product variety in the reference location, Edmonton. Product price data for Edmonton were supplemented with data from the CPI database and from the Internet in order to improve the match rate with products in each community.

Extreme values (outliers) were identified using the computer language SAS, and were verified and analyzed against the collected raw data. True outliers were replaced with data from the CPI database or from the Internet (imputation).

Prices were imputed for products that could not be matched to Edmonton, or when a price observation had not been collected in a community. Prices were imputed using donor data from neighbouring communities, and in some cases data from the 2010 iteration of the ASPI survey.

Among communities that required imputation, the imputation rates varied from a low of 2 per cent for Red Deer to a maximum of 10 per cent for Grande Cache (see Appendix 4 for list of imputation rates). This did not include imputation rates for clothing, purchase of vehicles and leasing of vehicles; in these cases, prices were imputed from the 2010 iteration of the ASPI survey, assuming price differences between the comparison and reference locations had the same proportions as in 2010.

5 Concept and methodology

This section presents the “spatial price index” concept and the price index methodology used for this project.

5.1 Spatial price index

A spatial price index is a number which expresses the cost of an identical market basket of products (goods and/or services) at a location (comparison location) relative to another location (reference location) at a given point of time. Comparing like-for-like products ensures that price differentials between the locations are due to pure price differences and not owing to the attributes of a product such as brand name, size or quantity. The following describes how a spatial price index is calculated.

$$\text{Spatial price index for location A} = \frac{\text{Cost of basket at location A}}{\text{Cost of same basket at reference location}} \times 100$$

Price index convention sets the value of the spatial price index of the reference (base) location to 100.0 with the spatial price index of each of the comparison location expressed as percentage of this value. For example, a spatial price index of 110 for a comparison location means that the average cost of a given basket of consumer goods and/or services is ten (10) per cent higher compared with its cost at the reference (base) location.

In contrast, a temporal consumer price index, CPI is a number that compares the cost of a basket of consumer goods and services between two **time periods** for a given location, whereas for a spatial price index the comparison is between two locations at one point in time. Consequently, comparing two sets of spatial price indexes that belong to two different time periods is inappropriate.

Strictly speaking, a spatial price index is not a “true” cost of living index. The concept of a standard of living connotes well-being or utility, which is not considered in the construction of a spatial price index.

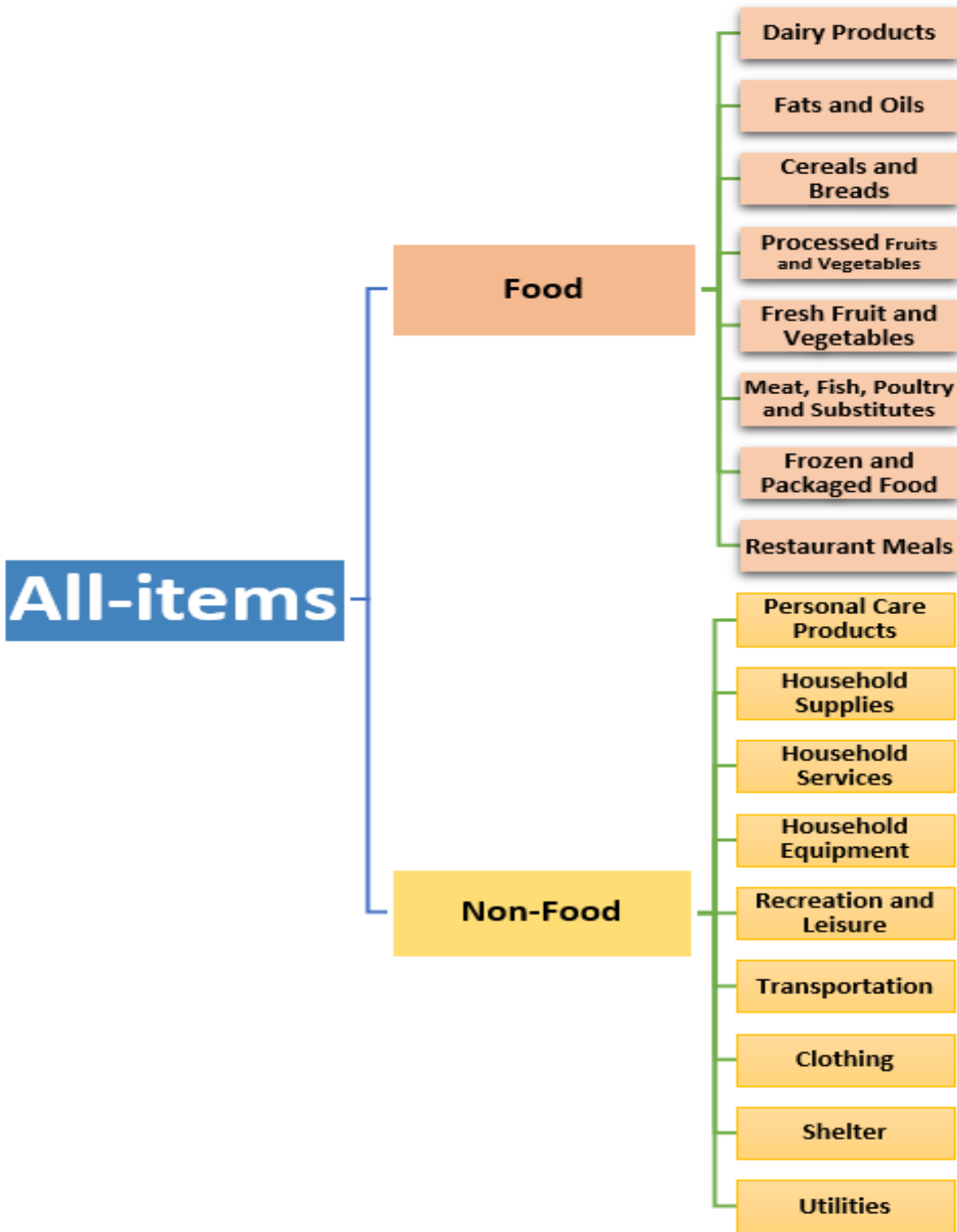
5.2 Price index methodology

5.2.1 Aggregation structure

There are twenty (20) aggregate price indexes estimated for each community (see diagram on next page). Of these, three (3) are major aggregates and the rest are sub-aggregate spatial price indexes. The major aggregate price indexes are the following:

1. All-items;
2. Food; and
3. Non-food.

The food and non-food aggregate price indexes are further decomposed into seventeen (17) sub-aggregates by commodity group, based on the same commodity classification used in the 2010 iteration of the ASPI survey.



Price indexes are constructed through successive phases of aggregation from the lower level towards the higher level price aggregation. Lower level aggregation is at the level of uniquely defined products (goods and services), whose prices are sampled from retail outlets. Individual price relatives for product varieties in the community and Edmonton were aggregated using a geometric mean formula to arrive at an unweighted price index for the elementary aggregate of the product.

Higher level price indexes were produced by aggregating lower level price indexes and weighting them with the relevant consumption expenditures of the average consumer (CPI basket weights). The rule of aggregation is the weighted sum of the lower level price indexes of products.

5.2.2 Price index methodology

The following sections present the price index methodology used for constructing the spatial price indexes in this project.

5.2.2.1 *Spatial price relative for each product variety*

Once product varieties have been matched between locations, price relatives are calculated for each product variety.

Hence, given a comparison location (A), reference location (B), product variety (i) and price (p), the price relative of the product variety (p_i) between the two locations is:

$$p_i = \frac{p_{Ai}}{p_{Bi}}$$

The ratio describes how much the price of product variety (i) at location A differs from location B.

5.2.2.2 *Elementary aggregation of spatial price relatives*

The computed spatial price relatives for a set of similar products are used to calculate an unweighted price index for the given set of similar products using the geometric mean formulae.

Given a comparison location (A), reference location (B), product variety (i), price (p) and ‘M’ number of similar products for which an unweighted price index needs to be calculated, the geometric mean ratio of the price relatives related to product (N), which is comprised of the similar product varieties, would be:

$$P_N = \prod_{i=1}^M \left(\frac{p_{Ai}}{p_{Bi}} \right)^{1/M}$$

5.2.2.3 Higher level price aggregation

Individual price indexes are aggregated to the next level higher in the classification structure, that is, the commodity group (e.g., from fresh milk to “Dairy products”). The different commodity group indexes are in turn aggregated to produce the all-items price index.

Since not all products have the same level of importance in the consumption basket of a consumer, higher level price aggregates for a commodity group price index are constructed by weighting each price index by the relevant expenditure weight of the specific product.

For example, given “K” number of products in a commodity group, a price index of a product ‘P_N’ and an expenditure weight of “W_N” for product (N), the aggregate spatial price index (PI) for the “J” commodity group under reference equals:

$$PI_J = \frac{[\sum_{N=1}^K (P_N \times W_N)]}{\sum_{N=1}^K W_N}$$

In other words, the all-items index is the weighted sum of the price indexes of all the products in the consumption basket.

5.2.3 Expenditure weights

Expenditure weights used for constructing the spatial price indexes were derived from the spending patterns of consumers in Edmonton, as reported by the 2014 edition of the Survey of

Household Spending (SHS). The data were normalized to account for the size and composition of the selected products used in the analysis. Expenditure weights by product category are included in Appendix 2.

5.3 Quality assurance of estimates

All estimates were independently produced by two analysts with outputs matched at each stage of estimation. The methodology, final estimates and this report underwent peer review within Statistics Canada.

6 Limitations of results

The indexes for the ASPI survey were estimated using a standard and accepted methodology for compiling spatial indexes. The products (goods and services) and the retail outlets visited were selected using a judgmental sampling approach. Since it is a sample survey, some sampling errors will characterize the results; however, this error is not quantifiable given the judgmental sample approach. Users should be aware of this possible limitation when interpreting the indexes.

Appendix 1

Alberta communities and survey coverage (ASPI and/or LCD).

	Community	ASPI	Alberta LCD
1	Athabasca	X	
2	Atikameg		X
3	Barrhead	X	
4	Bonnyville	X	
5	Brooks	X	
6	Calgary	X	
7	Camrose	X	
8	Canmore	X	
9	Cold Lake	X	
10	Desmarais (incl. Wabasca)		X
11	Drayton Valley	X	
12	Drumheller	X	
13	Edmonton (Base City = 100)	X	X
14	Fort Chipewyan		X
15	Fort McMurray	X	X
16	Fort Vermilion		X
17	Fox Lake Reserve		X
18	Garden Rr. (Garden Creek)		X
19	Grande Cache	X	X
20	Grande Prairie Stettler	X	X
21	Hay Lake Reserve		X
22	High Level	X	X
23	High Prairie	X	X
24	High River	X	
25	Hinton	X	X
26	Jasper	X	X
27	John d'Or Prairie		X
28	Lethbridge	X	
29	Little Buffalo		X
30	Lloydminster	X	
31	Manning		X
32	McLennan		X
33	Medicine Hat	X	
34	Olds	X	
35	Peace River	X	X

	Community	ASPI	Alberta LCD
36	Pincher Creek	X	
37	Ponoka	X	
38	Red Deer	X	
39	Red Earth Creek		X
40	Rocky Mountain House	X	
41	Slave Lake	X	X
42	St. Paul	X	
43	Stettler	X	
44	Taber	X	
45	Vegreville	X	
46	Wainwright	X	
47	Whitecourt	X	

Appendix 2

Expenditure weights for Edmonton (reference location) and the comparison locations, by product/commodity category.

Product	Expenditure Weight (%)
All items	100.0
1. Dairy products	0.9
Milk	
Homogenized (3 ¹ / ₂ %) and 2% UHT	
Canned evaporated milk	
Instant powdered skim milk	
Butter	
Ice cream	
Cheese	
Cheddar cheese	
Cream cheese	
Cheese slices/spread	
2. Fats & oils	0.1
Cooking oil	
Margarine, hard/soft	
Vegetable shortening	
3. Cereals & breads	1.1
Bread	
Breakfast cereal	
Cookies, plain/cream	
Soda crackers	
Enriched white flour	
Cake mix	
Pasta	
Macaroni and cheese	
Rice	
Oatmeal	
4. Processed fruits & vegetables	0.4
Fruit - Canned or bottled	
Peaches	
Pears	
Pineapple	
Mandarin oranges	
Fruit cocktail	
Apple sauce	
Fruit juice - Canned	
Apple	
Orange	

Product	Expenditure Weight (%)
Pineapple/grapefruit	
Tomato	
Fruit juice - Frozen orange	
Vegetable juices	
Jam	
Raisins	
Dried	
peas	
Vegetables - Canned	
Peas	
Corn, cream/niblets	
Green beans	
Baked beans	
Tomatoes	
Vegetables - Frozen	
Peas	
Corn	
Frozen French fries	
Instant potatoes	
5. Fresh fruits & vegetables	1.3
Apples	
Bananas	
Broccoli	
Cabbage	
Cantaloupe	
Carrots	
Celery	
Cucumber	
Grapes	
Lettuce	
Onions	
Oranges/grapefruit	
Potatoes	
Tomatoes	
Turnips	
6. Meat, fish, poultry & other	3.0
Eggs	
Beef - Various cuts	
Ham	
Pork	
Chicken - Various cuts	
Local fish/frozen fish	
Prepared frozen fish	

Product	Expenditure Weight (%)
Turkey	
Canned fish	
Sockeye/pink salmon	
Tuna	
Sardines	
Canned meat	
Canned luncheon meat	
Corned beef	
Canned ham	
Deli and deli-style meat	
sliced ham	
sliced bologna	
Sausage	
Bacon	
Wieners	
7. Frozen & packaged foods	2.0
Baby food	
Coffee	
Ground	
Instant	
Chocolate bars	
Chocolate drink mix	
Fruit drink crystals	
Frozen dinners and snacks	
Frozen desserts	
Jelly powder	
Peanut butter	
Syrup	
Pickles	
Potato chips	
Prepared mustard	
Tomato ketchup	
Salad dressing	
Food seasonings	
Table salt	
Black pepper, ground	
Soft drinks	
Canned soup	
Canned stew	
Dried soup	
Spaghetti sauce	
Sugar	

Product	Expenditure Weight (%)
Tea bags	
8. Restaurant meals	3.6
Breakfast	
Lunch	
Dinner	
Take-out pizza	
9. Personal care products	3.4
Non-prescribed medicines	
Pain relievers	
Anti-acids	
Vitamin "C"/multivitamins	
Allergy, cough cold and flu remedies	
Oral hygiene products	
Mouthwash	
Toothpaste	
Bar soaps	
Contact lens solution	
Deodorant/antiperspirant	
Disposable diapers	
Feminine hygiene	
Sanitary napkins	
Tampons	
Prescription medication	
Antihyperlipidemic	
ACE inhibitor	
Gastroesophageal reflux disease	
hair care products	
Shampoo	
Hair tint	
Hair spray	
Makeup, skin care, and manicure products	
Liquid make-up	
Nail polish	
Nail polish remover	
Hand lotion	
Baby powder	
Face cream	
Razor blades/shaving cream	
After shave lotion	
10. Household supplies	1.7
Detergent and other soaps	
All-purpose cleaner	
Liquid bleach	

Product	Expenditure Weight (%)
Dishwasher detergent, powder	
Dish detergent	
Laundry detergent	
Fabric softener, liquid/dryer sheets	
Dog food	
Canned dog food	
Dry dog food	
Food wrap	
Plastic wrap	
Foil wrap	
Floor wax	
Other household supplies	
Garbage bags	
Toilet bowl cleaner	
Light bulbs	
Paper towels	
Dry cell batteries	
Scouring powder/soap pads	
Other paper supplies	
Facial tissues	
Toilet tissues	
11. Household services	8.6
Baby-sitting	
Chiropractic services	
Coin operated laundry	
Daycare	
Dry cleaning	
Hair care services	
Internet Service	
Telephone services	
Dental services	
Veterinary services	
12. Household equipment	4
Other non-electric kitchen and cooking equipment	
stainless steel cookware	
Mattress and box spring	
Microwave oven	
Refrigerator	
Small electric food preparation appliances	
hand mixer	
electric kettle	
Vacuum cleaner, upright	

Product	Expenditure Weight (%)
13. Recreation & leisure	8.6
Beer, liquor and wine	
Canadian beer	
Wine/liquor	
Beer, liquor, wine - Served	
beer, in a bar or lounge	
highball, in a bar or lounge	
house wine in a restaurant	
Cable television	
CD/DVD prerecorded/recordable discs	
Cigarettes	
Camera accessories	
Film	
Film processing	
Fitness centre membership	
Movie/video game rental	
Newspapers	
Magazines	
Books	
Television	
Toys	
Board game	
Doll	
Construction set	
Supplies and parts for recreational equipment	
14. Transportation	23.6
Tires, batteries and other auto parts and supplies	
Antifreeze/Coolant	
Oil Filter	
Motor Oil	
Automotive/truck batteries	
Truck tires	
Spark plugs (1/2 ton truck)	
Headlight bulb	
Vehicle insurance	
Vehicle rental	
Driving lessons	
Gasoline	
Local Transit Fee	
Vehicle leasing	
New vehicle purchase	
Maintenance and repair of vehicles	
Oil change, filter and lubrication	

Product	Expenditure Weight (%)
labour rate	
Wheel alignment	
Taxi fare	
15. Clothing	5.9
Women and girls' wear (4 years and over)	
Men and boys' wear (4 years and over)	
Children's wear (under 4 years)	
16. Shelter	26.2
Housing costs	
Mortgage interest	
Property taxes	
Rental costs	
Tenant's Insurance	
Homeowner's insurance	
17. Utilities	5.6
Electricity	
Natural gas	
Water and sewage	

Appendix 3

Product varieties included in 2010 but not in the 2016 ASPI.

Product variety
Dairy products
Cottage cheese
Cream
Yogurt
Cereals & Breads
Doughnuts
Muffins
Fresh fruits & vegetables
Green pepper
Meat, fish, poultry & other
Peanuts
Frozen & packaged foods
Formula
Restaurant meals
Snack, Restaurant
Personal care products
Bandages
Lipstick
Women's spray cologne
Household Supplies
Cut/potted flowers
Envelopes
Sewing thread
Solid broadcloth
Table napkins - Paper
Household Services
House cleaning service
Shoe repairs
Household Equipment
Bath towel
Bed linens
Comforter/Blanket
Dinnerware
Entertainment center
Flatware
Glass pie plate
Hand tools
Paint
Power Tools
Shingles - Roof
Stove

Product variety

Window blinds

Recreation & Leisure

Camera – Digital/Video

DVD player

Sports equipment

Motion picture admission

MP3 player

Piano lesson

Transportation

Automobile paint job

Appendix 4

Imputation rates by community, ASPI.

Community	Imputation rate
Athabasca	4%
Barrhead	5%
Bonnyville	4%
Brooks	2%
Camrose	4%
Canmore	5%
Cold Lake	6%
Drayton Valley	4%
Drumheller	4%
Fort McMurray	3%
Grande Cache	10%
Grande Prairie	2%
High Level	4%
High Prairie	9%
High River	6%
Hinton	5%
Jasper	9%
Lethbridge	2%
Lloydminster	2%
Medicine Hat	2%
Olds	3%
Peace River	5%
Pincher Creek	4%
Ponoka	4%
Red Deer	2%
Rocky Mountain House	3%
Slave Lake	4%
St Paul	3%
Stettler	4%
Taber	5%
Vegreville	5%
Wainwright	4%
Whitecourt	2%