

CHAPTER 9

Per adult consumption of alcohol in British Columbia: 2002 to 2005

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Summary

Aggregated data on alcohol sales provides a more accurate indication of per adult alcohol consumption than population surveys, which underestimate total consumption. Such data can be used to better understand epidemiological issues related to alcohol consumption, policy development and evaluation.

Rationale

The overall aim of this component of the monitoring project is to assemble time series data of different geographic regions of British Columbia (BC) on alcohol sales and the liquor distribution network. Differences in per adult consumption in absolute alcohol across geographic regions of BC and over time are described. As well, relationships between alcohol consumption and population level demographic characteristics (i.e., age and sex) are examined.

Methods

Official sales data were collected for 28 regions of BC, by 4/5-week periods (2001 to 2005 fiscal years), 4 beverage categories, and by alcohol content. U-Brew data were obtained for each year and city. Home-brew production was estimated from survey data.

Results

Per adult alcohol consumption in the province has increased over the last five years, with the highest levels noted in the northern regions and the interior district of Squamish/Lillooet. Seasonal variation showed peaks in consumption of beer and coolers in summer months, whereas consumption of wines and spirits peaked in winter months. Since 2002, sales from take-out government stores have declined, while sales from private stores have increased. The average alcohol content for the four beverage categories was calculated at: beer - 5.00%, wine – 12.20%, coolers – 6.72% and spirits – 37.76%. The traditional conversion factors used by Statistics Canada appear too low for wine (11.5%) and coolers (5%). Home brew consumption was estimated from the Canadian Addiction Survey to be 4.3% of total absolute alcohol consumption. Per adult consumption was significantly related to the age distribution (i.e., being younger) and sex distributions (i.e., higher ratios of males) across the districts.

Discussion

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This data was useful in identifying trends and differences between geographic districts in per adult consumption. Further refinements are planned to obtain better estimates of home brew consumption, duty free sales and other unrecorded sources, and tourism adjustments. As well, we recommend that the next request for sales data be aggregated by the 202 local health area units. Future work will address the relationship between per adult alcohol consumption and other indicators of morbidity and mortality and address consumption of higher risk beverages. It is recommended that Statistics Canada incorporate updated estimates a typical alcohol content of main beverages in its estimates of per capita alcohol consumption which at present are likely to be underestimated.

Recommended indicators

Seasonally adjusted quarterly and annual rates of per adult absolute alcohol consumption a) in total for all beverages b) allocated across main beverage varieties of beer, wine, spirits and coolers c) "high risk" beverages comprising higher alcohol content varieties. To be updated every six months on the public domain website for each BC health authority and the province as a whole. These indicators will include estimates of alcohol consumption from unrecorded sources and adjustments for tourism.

Background

This component of the alcohol and drug monitoring project is aimed to better understand the variations of alcohol usage and consequences in BC, both over time and across geographic regions. Prior to this report, accurate consumption data of beverage types, variations across seasons, sales by type of establishment and differences across geographic has not been reported. Statistics Canada does compile yearly per adult sales of alcohol, but these are limited in that no geographic breakdowns are provided within the provinces. Furthermore, no details are provided on the strength of beverages sold, seasonal fluctuations or source of establishment where the alcohol was sold. The information contained in this paper describes the progress towards more comprehensive documentation of alcohol consumption among BC residents.

Official sales records provide more accurate data for determining per adult consumption of alcohol than population surveys, as the latter can underestimate overall consumption by as much as 55% (Stockwell et al., 2004). Another advantage of sales data compared to population surveys is that calculations of *absolute alcohol* are simpler and more accurate because breakdowns of the percent of alcohol within each beverage type are available. Survey data on volume consumed are problematic and difficult to estimate (Kerr et al., 2005). Sales data alone, however, have some limitations. Sales data do not include alcohol produced through home brew, cross-border shopping or illegal market activity. One assumption of sales data is that all the alcohol purchased is consumed. The conversion of a sales data into per adult alcohol consumption for a geographic area also has the implicit assumption that all alcohol purchased in that area is also consumed in that area. The smaller the area of analysis the

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more problematic is consumption is likely to be due to the mobility of BC residents and also the influx of tourists especially in some popular areas.

In Canada, sales of alcohol are controlled individually by each of the 13 provincial governments or territories. Since the provinces regulate distribution of alcohol, large differences exist in how liquor is sold. All provinces, except Alberta, have some direct government control over the sales of alcohol. Many provinces have some form of privatization, which is most common for wine and beer sales. For example, independent wineries are permitted to sell their wines directly to customers for take-out sales in all provinces. Quebec allows the sale of both wine and beers in grocery stores. Ontario has a separate distribution system, exclusively for beer. Alberta has a completely privatized system. Some provinces allow customers to make beers and wine in private controlled environments, called U-Brews and U-Vints, and reporting requirements vary by province. For example in Ontario, U-Brews and U-Vints are required to report dollar sales for tax purposes but not volumes of beer or wine sold, whereas in BC actual litres produced are reported. All provinces allow individuals to make wines or beer at home, but not spirits. Given the variations in regulations and reporting mechanisms across provinces, the methods used in this report for BC may not be feasible in other provinces; however, it is likely that more detailed information can be collected in every province than what is currently reported by Statistics Canada.

All provinces are required to report the dollar sales and gross litres of spirits, wines, coolers and beer through liquor, wine and beer authorities and their agents to Statistics Canada. Home brew production is not reliably recorded or reported in any of the provinces. Provincial regulations for reporting sales from U-Brews and U-Vints differ but are also not reported to Statistics Canada. Finally, duty free sales are not reported. Estimates of per adult consumption (15 years and older) are derived from the following conversion factors: spirits – 40%, liqueurs – 20%, coolers – 5%, and wines 11.5% (Statistics Canada, 2006).

In addition to the variations that exist in the distribution of alcohol among provinces, regulations within each province are evolving. In 1985, BC allowed wine and beer to be sold at private establishments for take out sales. In March 2002, a moratorium was lifted which allowed the establishment of new private stores that could sell all types of beverages, and the number of stores increased dramatically. In April 2002, spirits were also permitted to be sold in these stores.

Objectives

The primary aim of this paper is to provide descriptive epidemiological data on alcohol consumption in BC that can be used for research and programming purposes. The specific objectives of this paper are as follows:

- (1) To document the changes in per adult absolute alcohol consumption in BC over time and across regional districts. This

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objective includes an analysis by product type (i.e., beer, spirits, wine and coolers), seasonal fluctuations, and source of alcohol (i.e., U-Brews, take out at government regulated or private stores, and on-premise consumption at restaurants or bars).

- (2) To examine the relationships between per adult consumption patterns and population characteristics (i.e., age and sex distributions) of the 28 districts.

Methods

Data sources

1. Alcohol sales data

The BC alcohol sales data were obtained from the Ministry of Public Safety and Solicitor General Liquor Distribution Branch (LDB). The data were collapsed by the Liquor Distribution Branch into 28 BC regional districts and into 4 or 5 week periods for the fiscal years from 2001 to 2005. The data included the *litres of absolute alcohol* sold at off-site government and private liquor stores, and on-premise establishments for the fiscal years 2001-2005. Alcohol sales were broken down by type of beverage (beer, ciders/coolers, wines and spirits), and within each beverage type, with groupings based on the percent of alcohol for each product. The number of establishments by take-out premises (take-out government liquor stores and private liquor stores) and two categories of on-premise sales were also included.

2. U-Brew/U-Vint data

The LDB also provided U-Brew/U-Vint data by BC municipalities for years 2002-2006. The volume of absolute alcohol from U-Brew/U-Vint production was calculated for the 28 BC regional districts by calendar year. Ethanol conversion factors used for U-Brew/U-Vint products were 5.0% for beer and cider, and 12.0% for wine. The regional district estimates were based on alcohol data for municipalities in each of the regional districts.

3. Population data

Population data by regional district included population estimates (1986-2005) and projections (2006-2031) from BC Statistics (2006). The datasets consisted of population estimates, which incorporate information from the 1986, 1991, 1996, and 2001 Censuses of Canada, and population projections which contain estimates from 1986 to 2005, and projections for years 2006-2031. All figures are as of July 1st of the year stated (e.g., data for 1999/2000 include the census year from July 1st to June 30th). For calculation of per adult alcohol consumption in the province, the number of people in each region was used, and it represents the same total as the number of people aged 15 and over in the province of BC. This total population aged 15 and over is equal to the provincial population estimates.

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4. Canadian Addiction Survey

A secondary analysis was conducted on data from the Canadian Addiction Survey (Health Canada, 2004). This data was used to estimate the per adult consumption of beverages from home brew.

5. Socioeconomic data

Socio-economic variables for each district were obtained from the BC Statistics Website (www.bcstats.gov.bc.ca/). Socio-economic indicators included age and sex groups, average household income, percentage of multiple origins to population and percentage of aboriginal origins (Statistics Canada, 2003).

Average household income refers to the weighted mean total income of households in 2000. *Aboriginal identity* refers those persons who reported identifying with at least one aboriginal group, i.e., North American Indian, Métis or Inuit, and/or those who reported being a Treaty Indian or a Registered Indian as defined by the Indian Act of Canada and/or who were members of an Indian Band or First Nation. *Multiple origins* were based on ethnic origins, which refer to the ethnic or cultural groups to which the respondent's ancestors belong. An ancestor is someone from whom a person is descended and is usually more distant than a grandparent. Respondents were asked to specify as many groups as applicable.

6. Tourism data

Room revenue as an indicator of tourism associated with alcohol consumption was also analyzed. Room revenue data for years 2001-2005 was obtained from the BC Statistics Website (www.bcstats.gov.bc.ca/). Room revenue is the only statistic that provides detailed geographical breakdowns related to the tourism sector in BC on a monthly basis.

7. Statistical analyses

Descriptive analyses of absolute alcohol consumption were conducted by dividing the total litres of absolute alcohol by the population aged 15 and older. The groupings varied for different analyses by calendar year, 3-month periods, and type of establishment. Pearson r correlations were conducted between alcohol and sex ratio, percentage of population aged 20-29 to total population, room revenue for the 28 regional districts and other demographic indicators.

Results

1. Changes in total absolute alcohol consumption over-time and between regions

TABLE 9.1 presents per adult absolute alcohol consumption in litres of U-Brew/U-Vint production and sales from all sources for 28 regional districts and by calendar year (2002-2005). Absolute alcohol consumption increased in the province over the period from 8.18 in 2001 to 8.53 in 2005. Alcohol consumption of sales tended to increase in most regional districts during this period. Alcohol

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consumption fluctuated in some regions (e.g., Bulkley-Nechako, Central capital, East Kootenay, Kitimat-Stikine, Stikine) and decreased in other districts (e.g., Mount Waddington, Skeena-Queen Charlotte, Squamish-Lillooet).

Large differences in per adult consumption were noted among the districts. The Greater Vancouver area and the bordering Fraser Valley district had the lowest per adult consumption at 7.45 and 6.99, respectively. Very high per adult consumption was noted in Squamish-Lillooet (19.00), Northern Rockies (18.05), and Stikine (15.31). All the other districts had per adult consumption between 9.00 and 13.00.

TABLE 9.1: Per adult absolute alcohol consumption in litres for U-Brew/U-Vints and official sales for 28 regional districts

Regional district	Year			
	2002	2003	2004	2005
1. Alberni-Clayoquot				
Ubrew/Uvint	0.20	0.18	0.10	0.13
Sales	11.56	11.85	11.96	12.10
All sources	11.76	12.03	12.06	12.23
2. Bulkley-Nechako				
Ubrew/Uvint	0.17	0.19	0.13	0.19
Sales	9.08	9.33	8.75	8.84
All sources	9.25	9.51	8.87	9.03
3. Capital				
Ubrew/Uvint	0.64	0.59	0.57	0.59
Sales	8.45	8.86	9.11	9.27
All sources	9.08	9.44	9.67	9.86
4. Cariboo				
Ubrew/Uvint	0.25	0.23	0.15	0.23
Sales	9.19	9.23	9.14	9.13
All sources	9.44	9.47	9.28	9.36
5. Central Coast				
Ubrew/Uvint	None	None	None	None
Sales	11.34	13.75	13.82	12.83
All sources	11.34	13.75	13.82	12.83
6. Central Kootenay				
Ubrew/Uvint	0.37	0.39	0.34	0.33
Sales	9.35	9.55	9.67	9.81
All sources	9.71	9.94	10.00	10.14
7. Central Okanagan				
Ubrew/Uvint	0.52	0.46	0.36	0.44
Sales	9.41	9.79	10.16	10.38
All sources	9.93	10.25	10.52	10.82
8. Columbia-Shuswap				
Ubrew/Uvint	0.51	0.43	0.23	0.26
Sales	9.76	10.06	9.98	10.10
All sources	10.27	10.49	10.21	10.36

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9. Comox-Strathcona

Ubrew/Uvint	0.60	0.58	0.71	0.73
Sales	9.61	10.04	10.20	10.27
All sources	10.21	10.62	10.91	11.01

10. Cowichan Valley

Ubrew/Uvint	0.51	0.61	0.58	0.57
Sales	8.72	8.93	9.08	9.15
All sources	9.24	9.54	9.66	9.72

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TABLE 9.1 (continued)

Regional district	Year			
	2002	2003	2004	2005
11. East Kootenay				
Ubrew/Uvint	0.68	0.68	0.66	0.67
Sales	10.70	10.97	10.72	10.63
All sources	11.37	11.65	11.39	11.30
12. Fraser Valley				
Ubrew/Uvint	0.49	0.45	0.46	0.44
Sales	6.37	6.58	6.64	6.55
All sources	6.85	7.03	7.10	6.99
13. Fraser-Fort George				
Ubrew/Uvint	0.26	0.26	0.25	0.38
Sales	8.65	8.52	8.36	8.61
All sources	8.92	8.78	8.61	9.00
14. Greater Vancouver				
Ubrew/Uvint	0.33	0.31	0.27	0.28
Sales	6.51	6.74	6.73	7.17
All sources	6.84	7.05	7.00	7.45
15. Kitimat-Stikine				
Ubrew/Uvint	0.38	0.05	0.08	0.08
Sales	8.61	8.56	8.33	8.32
All sources	8.99	8.62	8.41	8.40
16. Kootenay-Boundary				
Ubrew/Uvint	0.30	0.29	0.25	0.23
Sales	9.00	9.18	9.20	9.26
All sources	9.30	9.47	9.46	9.49
17. Mount Waddington				
Ubrew/Uvint	0.24	0.25	0.24	0.30
Sales	12.90	13.10	12.38	11.91
All sources	13.13	13.35	12.62	12.21
18. Nanaimo				
Ubrew/Uvint	0.55	0.56	0.48	0.56
Sales	9.30	9.59	9.78	9.86
All sources	9.85	10.15	10.27	10.42
19. North Okanagan				
Ubrew/Uvint	0.69	0.72	0.66	0.59
Sales	8.62	8.96	9.12	9.38
All sources	9.30	9.68	9.77	9.97
20. Northern Rockies				
Ubrew/Uvint	None	None	None	None
Sales	17.77	20.54	19.66	18.05
All sources	17.77	20.54	19.66	18.05

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TABLE 9.1 (continued)

Regional district	Year			
	2002	2003	2004	2005
21. Okanagan-Similkameen				
Ubrew/Uvint	0.49	2.54	0.40	0.43
Sales	9.92	10.58	10.94	11.40
All sources	10.41	13.12	11.34	11.82
22. Peace River-Liard				
Ubrew/Uvint	0.13	0.18	0.14	0.12
Sales	9.13	9.57	9.17	9.85
All sources	9.26	9.75	9.31	9.97
23. Powell River				
Ubrew/Uvint	0.43	0.34	0.43	0.40
Sales	9.15	9.38	9.49	9.40
All sources	9.58	9.72	9.92	9.80
24. Skeena-Queen Charlotte				
Ubrew/Uvint	0.29	0.29	0.27	0.46
Sales	10.93	10.96	10.59	10.40
All sources	11.22	11.25	10.85	10.87
25. Squamish-Lillooet				
Ubrew/Uvint	0.32	0.29	0.22	0.21
Sales	19.98	20.19	19.47	18.80
All sources	20.30	20.49	19.70	19.00
26. Stikine				
Ubrew/Uvint	0.05	None	None	None
Sales	16.23	14.76	15.92	15.31
All sources	16.28	14.76	15.92	15.31
27. Sunshine Coast				
Ubrew/Uvint	0.62	0.57	0.61	0.64
Sales	11.14	11.61	11.71	11.75
All sources	11.76	12.18	12.32	12.39
28. Thompson-Nicola				
Ubrew/Uvint	0.48	0.43	0.41	0.40
Sales	9.37	9.59	9.64	9.83
All sources	9.85	10.02	10.05	10.22
Total				
Ubrew/Uvint	0.40	0.43	0.35	0.36
Sales	7.78	8.04	8.07	8.17
All sources	8.18	8.46	8.42	8.53
Statistics Canada (2006) Estimates for BC	7.7	7.8	8.0	8.1

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Figures 9.1- 9.4 show per adult litres of absolute alcohol consumption on a map of BC for the calendar years 2002 to 2005.

FIGURE 9.1: Per Adult Alcohol Consumption in 28 BC Regional Districts, 2002

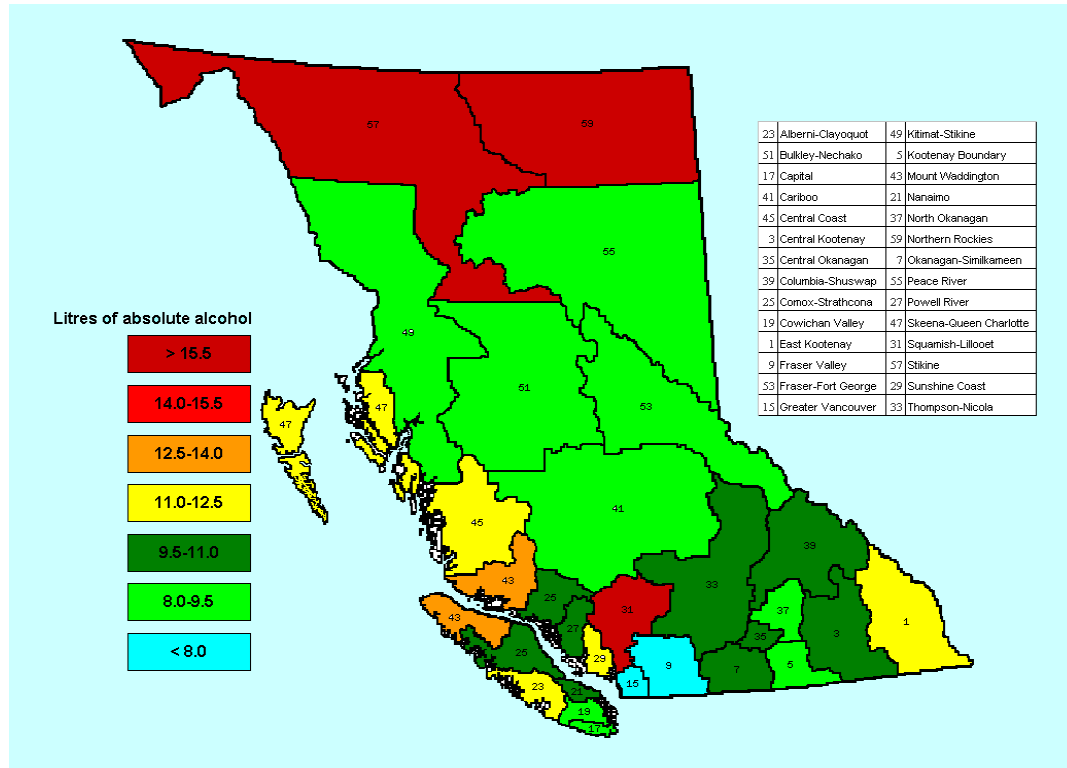
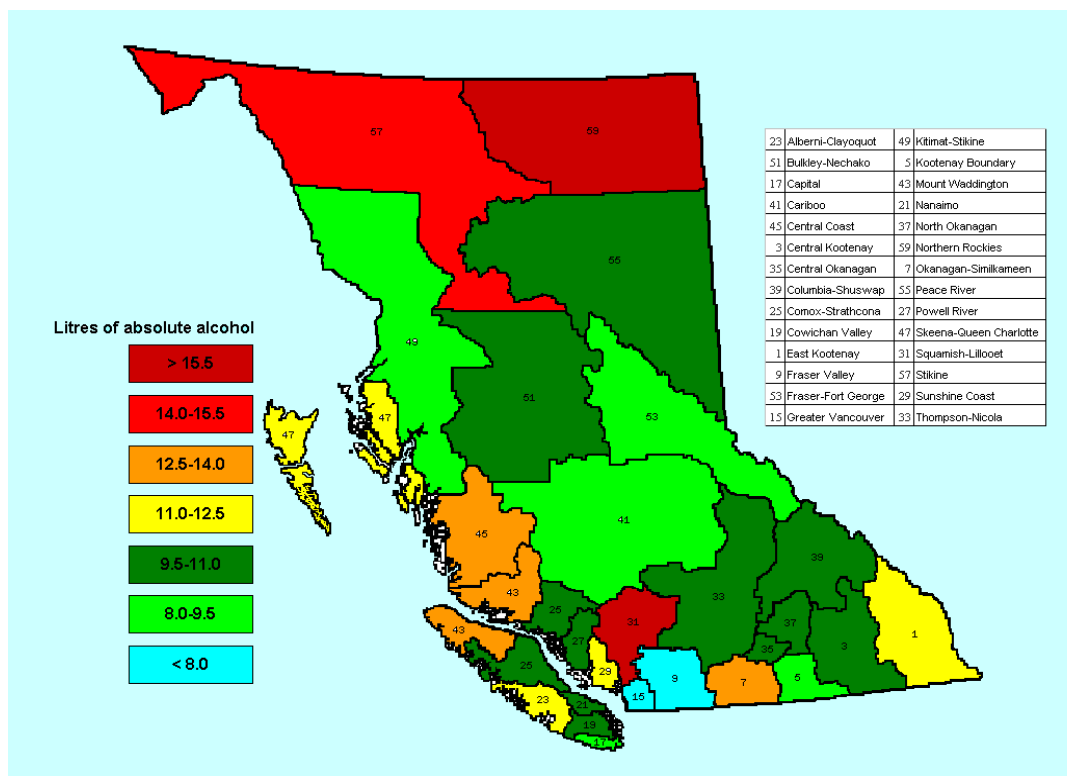


FIGURE 9.2: Per Adult Alcohol Consumption in 28 BC Regional Districts, 2003



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FIGURE 9.3: Per Adult Alcohol Consumption in 28 BC Regional Districts, 2004

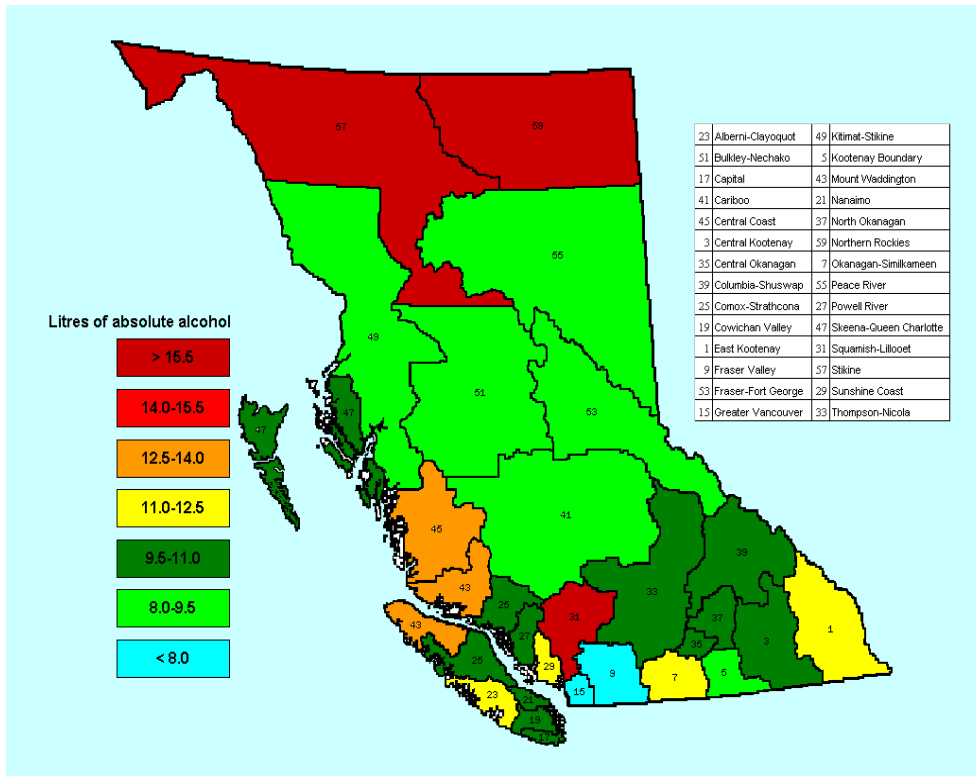
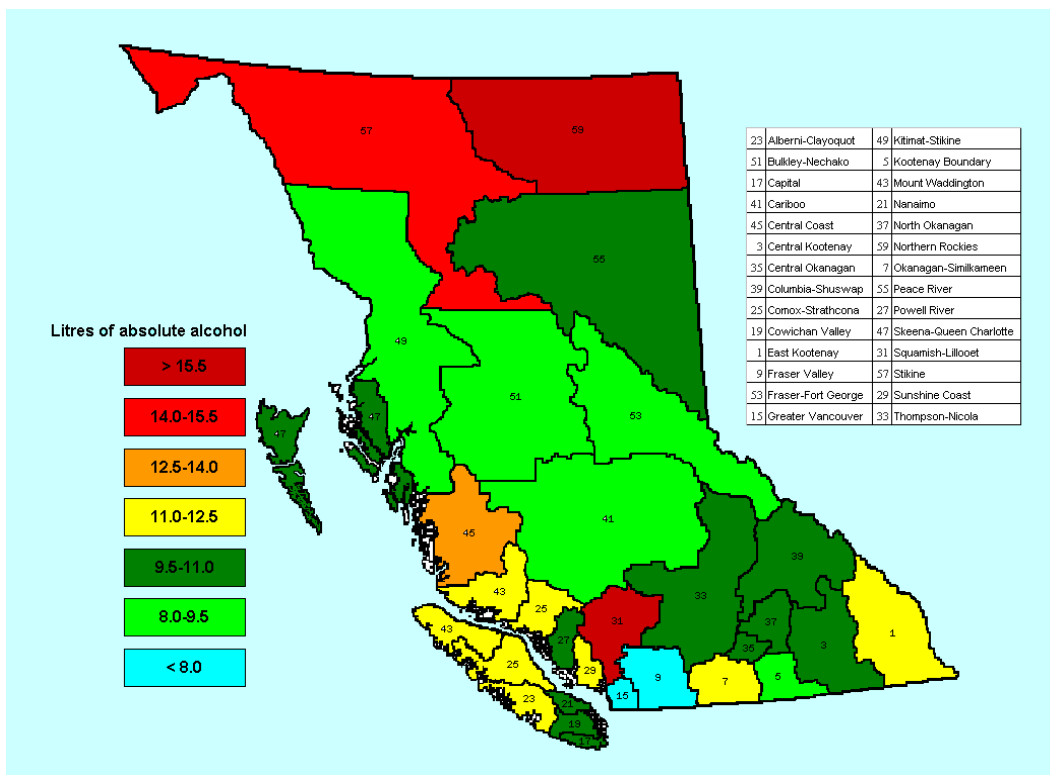


FIGURE 9.4: Per Adult Alcohol Consumption in 28 BC Regional Districts, 2005

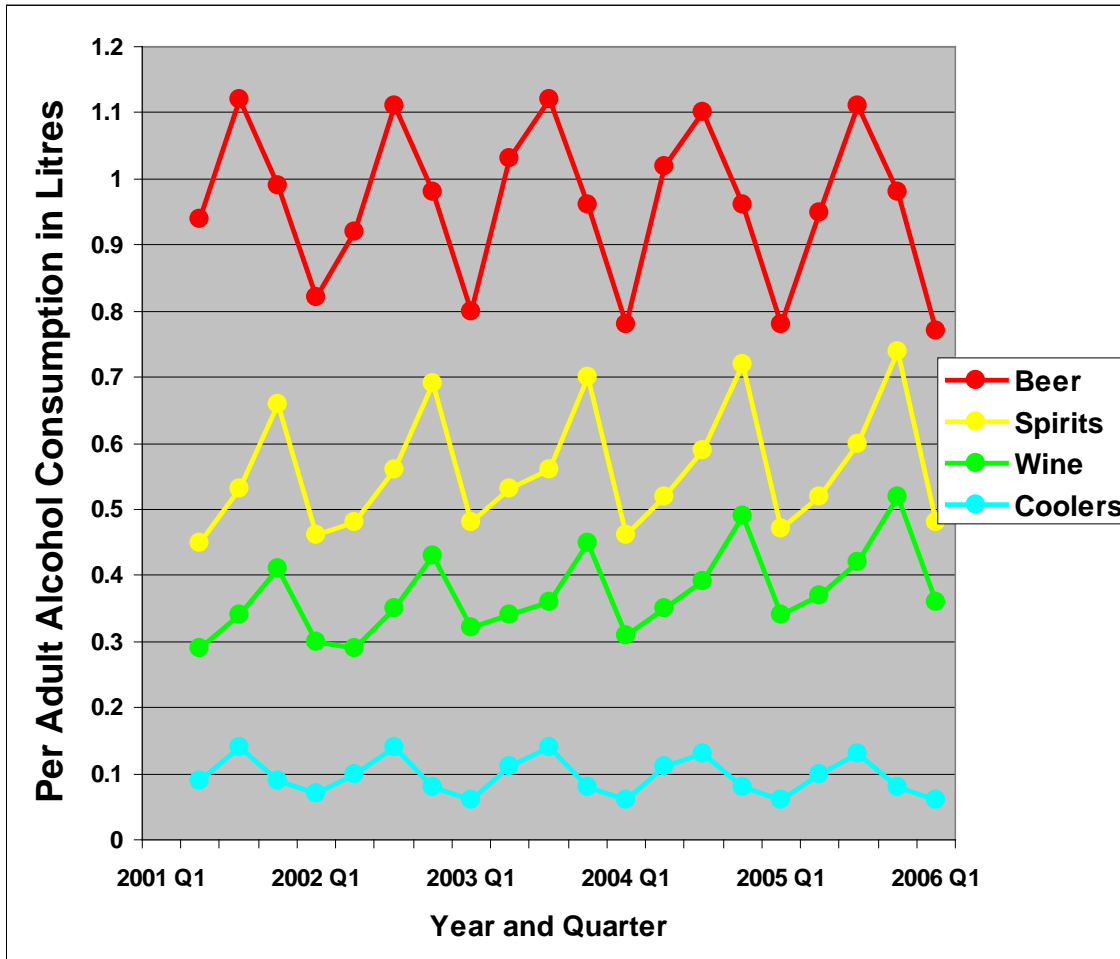


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2. Alcohol consumption for the four beverage groups by season

Figure 9.5 shows per adult (15 years and older) absolute alcohol consumption in litres by type of products and season from April 2001 to March 2006. As can be seen in this figure, seasonal peaks in consumption differed by product types. While consumption of beer and coolers peaked in summer months, consumption of wines and spirits peaked in winter months.

FIGURE 9.5: Absolute alcohol consumption in BC by quarters



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**3. Per adult absolute litres of alcohol sold by establishment type in the
28 regional districts from 2001 to 2005**

In BC, take-out alcohol can be purchased from three different types of establishments: (1) government controlled liquor stores (GLS) that sell all types of alcohol products, (2) private liquor stores that can also sell all types of alcohol products, but where the prices are slightly higher, and (3) licensed bars which sell beer and wine for take-out at considerably higher prices. Alcohol is also sold for on-premise consumption at establishments designated as either restaurants (where food is primarily sold) or bars (where alcohol is primarily sold). **Figure 9.6** shows the breakdown of percent of absolute alcohol sold by various sources in BC for 2004. As can be seen in this figure, only a small proportion of alcohol is consumed in public places (about 19.2%).

FIGURE 9.6: Percent Absolute Alcohol Sold by Source in BC in 2004

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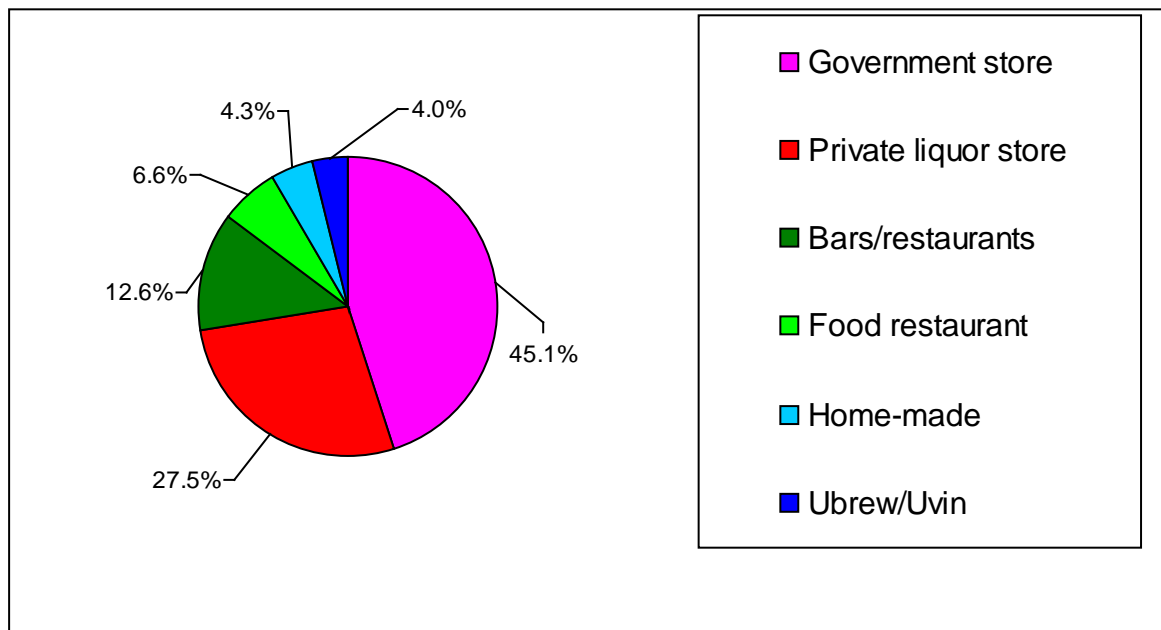


Table 9.2 presents per adult alcohol consumption in litres by type of establishment in 28 regional districts in 2005. As shown in the table, the majority of alcohol purchased in BC was from take-out sales from either government liquor stores (3.66) or private liquor stores (2.84). Sales from government stores was generally higher than from private liquor stores in the more urbanized areas, such as Greater Vancouver and the Victoria area, whereas this pattern was reversed in rural areas, such as the Northern Rockies and Stikine districts. **Table 9.3** shows the number of establishments for the various categories from

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which alcohol can be purchased. Private liquor stores were much more common (938) than government liquor stores (208) in 2005.

In 2002, the government permitted private operators to sell all alcohol products for take-out sales and this period showed a substantial growth. Changes in per adult consumption by type of establishment from 2001 to 2005 and changes in the number of establishments are shown in **Table 9.4**. In this time period, the number of private liquor stores increased dramatically from 539 to 938, while the number of government liquor stores declined marginally. Correspondingly, per adult sales at private liquor stores increased from 1.56 to 2.84, whereas sales at government liquor stores dropped from 4.31 to 3.66.

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**TABLE 9.2: Per adult absolute alcohol consumption in litres by
establishments in BC regional districts in 2005**

Regional districts	Establishments					
	Ubrew/ Uvint	Restaurant	GLS †	Bars	Private take out store	All
Alberni-Clayoquot	0.13	0.64	4.81	1.47	5.18	12.23
Bulkley-Nechako	0.19	0.22	4.38	1.01	3.23	9.03
Capital	0.59	0.68	3.87	1.22	3.51	9.86
Cariboo	0.23	0.23	2.97	0.81	5.11	9.36
Central Coast	None ‡	0.13	4.75	2.28	5.68	12.83
Central Kootenay	0.33	0.34	3.66	1.49	4.33	10.14
Central Okanagan	0.44	0.62	3.55	1.31	4.91	10.82
Columbia-Shuswap	0.26	0.49	2.98	1.16	5.48	10.36
Comox-Strathcona	0.73	0.30	3.41	1.26	5.31	11.01
Cowichan Valley	0.57	0.32	4.49	0.88	3.46	9.72
East Kootenay	0.67	0.65	4.47	1.76	3.76	11.30
Fraser Valley	0.44	0.30	2.34	0.60	3.32	6.99
Fraser-Fort George	0.38	0.41	4.34	1.04	2.83	9.00
Greater Vancouver	0.27	0.69	3.56	0.95	1.62	7.08
Kitimat-Stikine	0.08	0.25	3.16	0.99	3.91	8.40
Kootenay Boundary	0.23	0.34	4.34	1.24	3.34	9.49
Mount Waddington	0.30	0.16	6.02	1.92	3.82	12.21
Nanaimo	0.56	0.52	3.84	1.18	4.33	10.42
North Okanagan	0.59	0.36	2.74	1.16	5.13	9.97
Northern Rockies	None	0.51	5.98	2.33	9.22	18.05
Okanagan-Similkameen	0.43	0.44	4.59	1.29	5.08	11.82
Peace River-Liard	0.12	0.42	3.52	1.51	4.41	9.97
Powell River	0.40	0.36	3.55	1.10	4.39	9.80
Skeena-Queen Charlotte	0.46	0.67	4.29	1.69	3.75	10.87
Squamish-Lillooet	0.21	3.35	6.96	4.39	4.10	19.00
Stikine Region	None	None	None	1.28	14.02	15.31
Sunshine Coast	0.64	0.40	6.60	1.06	3.68	12.39
Thompson-Nicola	0.40	0.46	4.11	1.35	3.92	10.22
Total	0.36	0.60	3.66	1.08	2.84	8.53

Data source: Alcohol consumption data were provided by the Ministry of Public Safety and Solicitor General Liquor Distribution Branch. Population data were provided by BC Statistics. † Government liquor store. ‡ Data unavailable for this regional district.

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**TABLE 9.3: Number of each type of establishments for 28 regional districts
in BC in 2005**

Regional districts	Establishments					
	Ubrew/ Uvint †	Restaurant	GLS ‡	Bars	Private store	All
Alberni-Clayoquot	2	45	3	30	10	90
Bulkley-Nechako	4	38	6	36	18	102
Capital	38	365	17	154	69	643
Cariboo	7	66	3	40	38	154
Central Coast	8	3	1	6	2	20
Central Kootenay	14	76	7	64	38	199
Central Okanagan	7	141	5	84	55	292
Columbia-Shuswap	13	81	4	49	34	181
Comox-Strathcona	7	94	7	63	41	212
Cowichan Valley	11	73	5	46	31	166
East Kootenay	21	91	7	87	30	236
Fraser Valley	4	174	7	72	46	303
Fraser-Fort George	70	85	7	55	30	247
Greater Vancouver	42	1,942	68	515	199	2,766
Kitimat-Stikine	2	38	4	30	12	86
Kootenay Boundary	4	33	5	40	17	99
Mount Waddington	3	9	4	24	11	51
Nanaimo	18	142	7	84	34	285
North Okanagan	11	70	5	50	26	162
Northern Rockies	None	3	1	6	3	13
Okanagan-Similkameen	12	99	6	70	71	258
Peace River-Liard	2	45	5	46	23	121
Powell River	3	26	1	20	13	63
Skeena-Queen Charlotte	2	32	3	24	7	68
Squamish-Lillooet	3	100	5	49	14	171
Stikine Region	2	None	None	3	2	7
Sunshine Coast	4	29	3	17	11	64
Thompson-Nicola	8	145	12	102	53	320
Total	322	4,045	208	1,866	938	7,379

Data source: Alcohol consumption data were provided by the Ministry of Public Safety and Solicitor General Liquor Distribution Branch. Population data were provided by BC Statistics. Δ Ubrew/Uvint includes counts for calendar year and other counts for fiscal year, i.e., April 2005-March 2006. † Calculation counts were based on new licenses issued and do not include establishments that closed. ‡ Government liquor store.

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TABLE 9.4: Per adult pure alcohol consumption in litres by establishments in BC in 2002 and 2005

Type of Establishments	Number of Establishments †		Per Adult Alcohol in Litres	
	2002	2005	2002	2005
U-Brew/U-Vint	287	322	0.41	0.36
Food restaurants	3,776	4,045	0.55	0.60
Bars	1,869	1,866	1.24	1.08
Government Liquor Store (take-out)	222	208	4.24	3.66
Private Liquor store (take-out)	648	938	1.75	2.84
All	6,802	7,379	8.18	8.53

4. Average alcohol contents in the 4 beverage groups

The data provided allows for an examination of the average alcohol content in the four beverage groups of beer, coolers, wines and spirits. Sales data provided by Statistics Canada for each province includes the litres sold in each of these beverage categories without detailed conversions to absolute alcohol. The average percent of alcohol used by Statistics Canada to calculate absolute alcohol is: spirits - 40%, liqueurs - 20%, coolers - 5%, and wines - 11.5% (Statistics Canada, 2006). As can be seen on **Table 9.5**, each of these beverage categories has a range of products that varies in alcohol content. Although the conversion factors used by Statistics Canada for beer and spirits appear fairly accurate, the actual percent of absolute alcohol in wines and coolers is higher (12.2% for wine and 6.72% for coolers). Comparison of the total estimate of absolute alcohol sold in BC by Statistics Canada and the detailed conversions used here (excluding U-Brew/U-Vint sales) indicate the Statistics Canada final estimate is lower than our figures, which is likely partially due to the conservative conversion factors used.

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TABLE 9.5: Absolute alcohol consumption in litres and percentage by alcohol content for the beer, cooler, spirits and wine in BC in 2001-2006 †

Alcohol content (ml%) for beverages	Alcohol in litres	% of Alcohol
Beer		
2.9-3.9	88,564	0.13
4.0	3,162,278	4.75
4.1-4.9	4,815,543	7.23
5.0	50,049,243	75.10
5.1-5.9	4,684,595	7.03
6.0 AND ABOVE (average=6.5)	3,841,441	5.76
Total	66,641,662	100
Average percent alcohol – 5.00%		
Statistics Canada conversion factor (5%)		
Cooler		
3.9-4.9	27,086	0.41
5.0	353,778	5.37
5.1-6.9	748,235	11.36
7.0	5,452,348	82.76
7.1 AND ABOVE (average=7.5)	6,472	0.10
Total	6,587,919	100.00
Average percent alcohol – 6.72%		
Statistics Canada conversion factor (5%)		
Spirits		
7.00-34.99	2,497,733	6.42
35.00-39.99	2,281,614	5.87
40	33,663,996	86.57
40.10-59.9	306,742	0.79
60 AND ABOVE (average=65)	135,401	0.35
Total	38,885,487	100.00
Average percent alcohol – 37.76%		
Statistics Canada conversion factor for spirits (40%) Liqueurs (20%)		
Wine		
5.0-10.9	1,044,605	4.05
11.00	3,376,237	13.10
11.1-11.4	134,528	0.52
11.5	4,201,105	16.30
11.6-11.9	249,947	0.97
12.0	5,245,484	20.35
12.01-12.49	201,847	0.78
12.5	3,316,146	12.87
12.51-13.49	2,523,427	9.79
13.50	1,892,848	7.35
13.51-13.99	340,930	1.32
14.00-14.99	1,573,220	6.10
15.00-19.99	1,167,911	4.53
20 AND ABOVE (average=22.5)	502,057	1.95
Total	25,770,291	100.00
Average percent alcohol – 12.20%		
Statistics Canada conversion factor (11.5%)		

Note: † The estimates were based on the alcohol sale data in 2001-2006 from the Liquor Branch.

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5. Estimates of home brew consumption

Since home brew data is not officially recorded, this information must be collected from either population surveys or extrapolations from secondary sources. The estimates provided below were derived from an analysis of 986 BC respondents to the Canadian Addiction Survey (Health Canada, 2004), who were asked whether they made beer or wine at home or at other home or at a U-Brew or U-Vint outlet. The average for the weighted sample was 0.712 litres of absolute alcohol per person. Applying this number to the total adult BC population results in $0.712 \times 3,561,941$ (population 15 years and older) = 2,536,102 litres. This number reflects estimates of both U-Brew/U-Vint and home brew production. The final population estimate was calculated by subtracting the known U-Brew/U-Vint sales: $2,536,102 - 1,223,115$ (U-Brew/U-Vint sales) = 1,312,987 litres of absolute alcohol from home brew. This figure represents about 4.3% of total alcohol consumption and is likely an underestimate of the true amount, because data from surveys typically underestimate actual consumption. Additional estimates are planned using other secondary data sources, such retail sales and the BC grape marketing board (see Macdonald et al., 1999).

6. Tourism adjustment: alcohol consumption for summer versus winter months

Tourism analyses included the ratio of alcohol consumption between summer (July-September) versus winter (January-March) sales for each of the 28 regional districts for aggregated 2002-2005 data. More alcohol was sold in the summer months than in the winter months in 26 regional districts. The exceptions were the Northern Rockies and Squamish-Lillooet. A statistically significant relationship between seasonal alcohol consumption ratios and room revenue ratios suggests that some of the elevated levels of alcohol consumption may be due to tourism.

The relationship between the ratio of alcohol consumption for summer versus winter in 2005 and the ratio of room revenue for summer versus winter in 2005 in the regional districts is presented in **Figure 9.7**. The regression line is significant ($R^2 = 0.3504$, $p = 0.0007$). This data will be useful for the development of detailed tourism adjustments.

7. Correlations of absolute alcohol consumption with demographic characteristics and alcohol related mortality

The relationship between per adult absolute alcohol consumption and demographic characteristics in BC's 28 regional districts in 2002-2005 was investigated to assess whether variations in per adult consumption among the regions can be explained by the corresponding demographic characteristics. Various population surveys have found that younger people drink more than older people, and that males drink more than females (see, for example, Stockwell et al., 2004).

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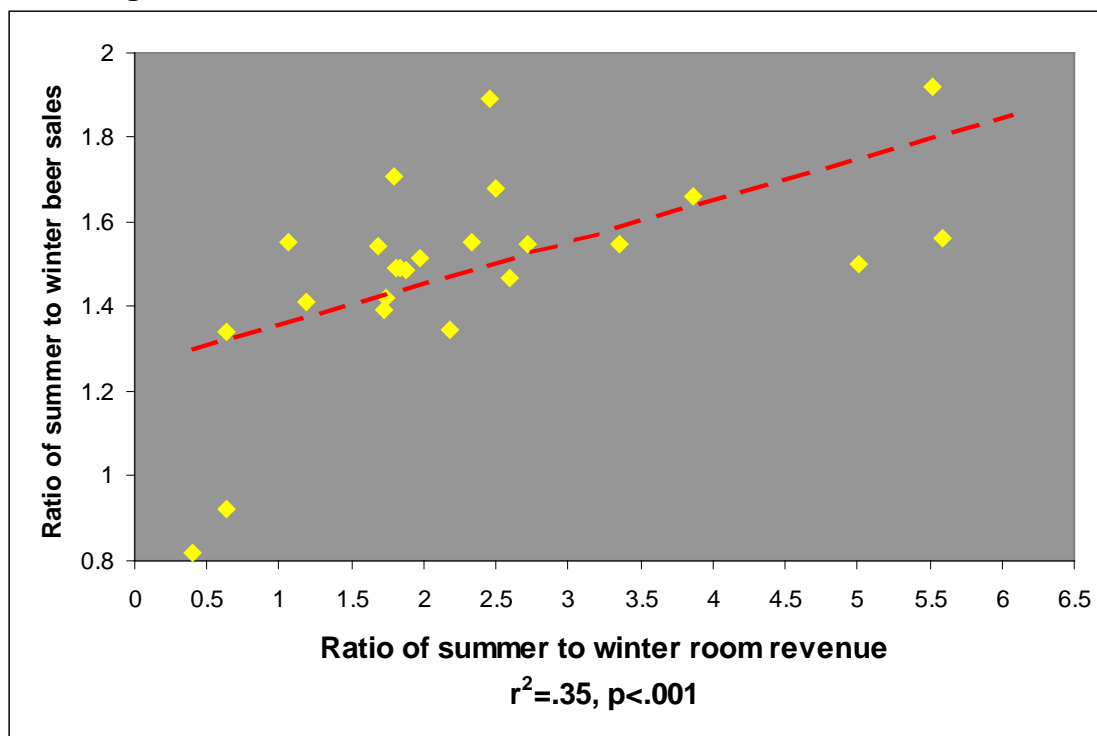
The relationship between the average of per adult alcohol sales (2002 to 2005) and the sex ratios (i.e., males and females aged 15 and over) in the regional districts was also examined (see **Figure 9.8**). A regression line showed a significant positive relationship ($R^2= 0.2217$, $p<0.0067$).

The ratio of population aged 20-29 to population aged 15 and over was calculated for each district in order to examine the relationship between alcohol consumption and young population ratio (see **Figure 9.9**). This relationship was also significant ($R^2=0.1797$, $p=0.0142$).

The relationship between per adult alcohol consumption and other socio-economic indicators was examined. No significant relationships were found between per adult consumption and household income, percentage of multiple origins and percentage of aboriginal origins.

The relationship between per adult consumption and standardized alcohol related mortality ratio was examined. A weak non-significant positive relationship was found ($R^2=.036$, $p=.172$). When high risk drinking was correlated with alcohol related mortality, the relationship became marginally stronger, although still non-significant ($R^2=.082$, $p=.08$). Lack of significance is likely related to several factors. Alcohol related mortality is a composite variable composed of several acute outcomes (e.g., accidental poisonings, fetal alcohol syndrome) and chronic alcohol conditions (alcoholic cirrhosis, alcoholic hepatitis and alcohol psychoses). More precise measures and advanced models, such as time-lagged models, are likely needed.

FIGURE 9.7: The relationship between the ratio of beer consumption (litres) for summer vs. winter and the ratio of room revenue for summer vs. winter at the regional districts in BC in 2005



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FIGURE 9.8: Relationship between per adult consumption and adult sex ratio for 28 regions

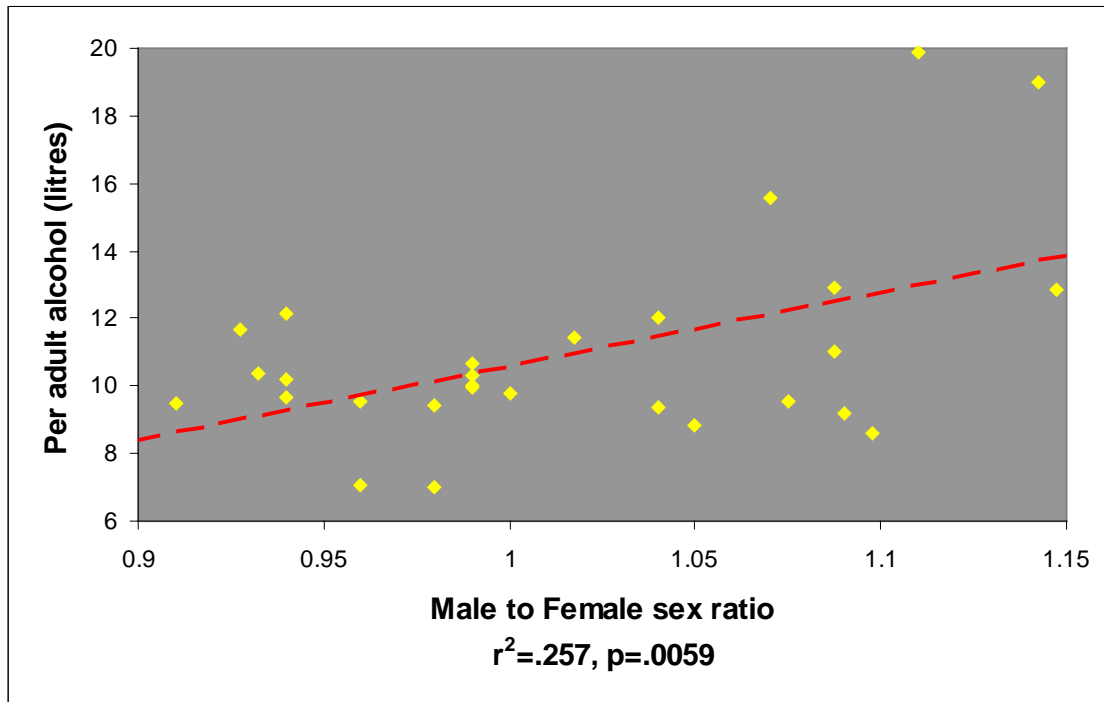
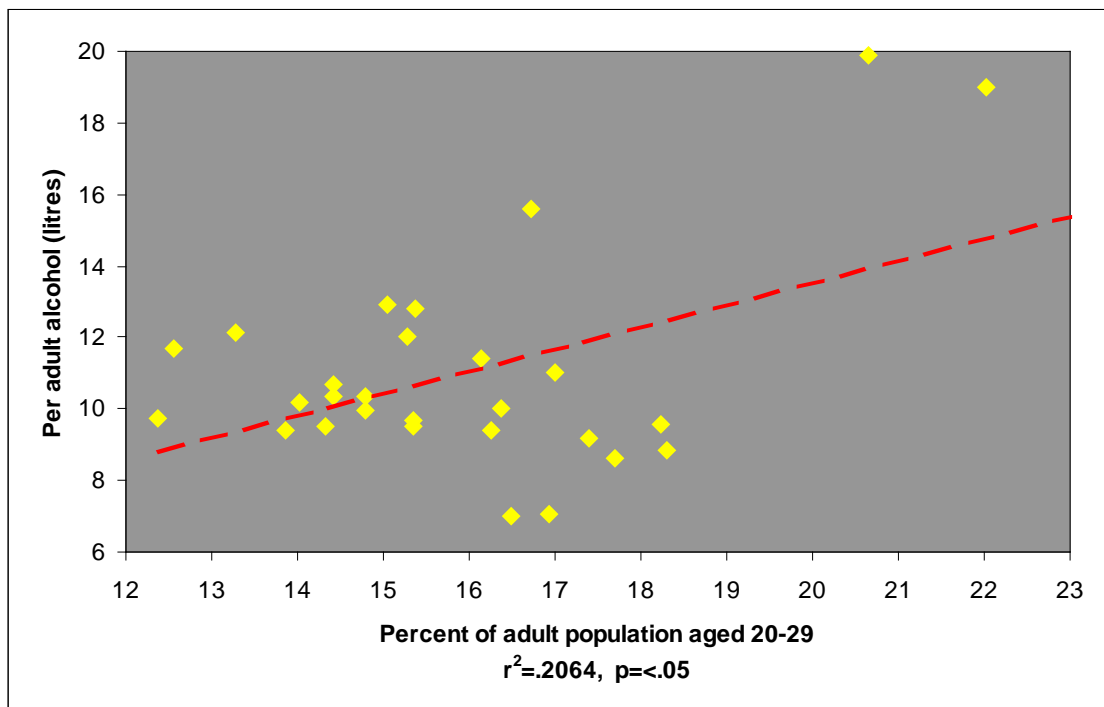


FIGURE 9.9: Relationship between per adult alcohol consumption and ratio of adult population aged 20-29



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Discussion

The sales data presented here provide an accurate picture of the recorded alcohol consumption, showing year-to-year changes among the 28 regions of BC. Although alcohol consumption from official sales and U-Brew/U-Vint sources accounts for most of the total consumption, consumption of alcohol from cross-border shopping (i.e., duty free sales) and illegal channels would increase these figures marginally. Alcohol can be purchased outside the province, but consumed inside BC. Large price differentials of alcohol have existed between the U.S. and Canada, with lower prices found in the U.S. than in Canada. It is therefore likely that greater volumes of alcohol (usually in the form of spirits) entered into Canada than into the U.S. Anecdotal reports of cross-border shopping appear to substantiate this claim. Detailed figures on the extent of this probable excess in cross-border shopping suggest that duty free sales account for about 2% of total alcohol purchases (Macdonald et al., 1999). Illegal alcohol sales in Canada likely account for less than 1% of total sales (Macdonald et al., 1999).

The figures derived from the Canadian Addiction Survey to estimate home brew consumption are also likely higher than reported. Consumption data through surveys typically underestimate actual consumption (Stockwell et al., 2004). On the other hand, per adult figures are likely conservative because tourism effects are not included in the calculations. Although effects of tourists consuming alcohol in the province are counterbalanced to some extent by BC residents travelling and consuming alcohol outside the province, the net effect on per adult consumption would remain lower since BC is a province with considerable tourism. More detailed analyses are required to definitively answer these questions; however, given the factors not accounted for above, the net per adult figures contained in this report are likely somewhat lower than actual consumption. Overall, however, the figures are likely more accurate and detailed than any other figures ever reported in BC. As a guide to the geographic distribution of adult per capita alcohol consumption across the province, however, an adjustment for local tourism is required. Local tourism can be measured to a degree from room revenue and it can be reasonably assumed that the distribution of BC residents leaving the province on vacation or for business is more evenly spread across the province.

This study was guided by principles of descriptive epidemiology. The observations of changes over time and differences in per adult consumption across various geographic regions of BC have been useful for the identification of districts that may benefit from prevention initiatives. Two districts, Stikine and Squamish-Lillooet, have highly elevated per adult consumption and show consumption of higher risk alcohol beverages than districts in the rest of the province. Another observation was for the trend towards an increase in take-out sales from private establishments and a decrease from government take-out sales for the period of 2002 to 2005. These shifts in market share were accompanied by a slight decrease in the number of government stores and a large increase in private stores. The data also allowed an analysis of the average

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percent of alcohol in the four major beverage groups. The conversion factors that Statistics Canada has used for coolers (5%) and wines (11.5%) is low compared to the average alcohol content derived from analyses of this dataset (6.72% for coolers and 12.20% for wines).

Recommendations

Future objectives of the project include incorporating more detailed data for alcohol consumption from unrecorded sources, such as home brew, cross-border shopping and illegal sources, and estimating tourism effects. In addition, better models are needed to examine the relationships of per adult consumption with alcohol related diseases. Specifically, separation of acute and chronic alcohol-related diseases is required. Finally, more research is needed to better identify regional differences in higher risk beverages, such as fortified wines.

Some of the current challenges include collapsing data into common geographic units, because different reporting systems exist. Data is available in different geographic units, such as Census tracts, Local Health Areas, Districts and Local Health Authorities. Also, the size of the populations in the districts varied considerably from over 1,800,000 in Greater Vancouver to about 1,000 in Stikine. Alcohol consumption and rates of morbidity and mortality can become unstable with small population sizes; however, with larger populations considerable heterogeneity may exist in the populations and important differences can be missed. Our hope is that we can obtain alcohol sales data by 202 local health areas of BC, which would allow the flexibility in grouping the data into different geographic units of particular relevance to decision makers such as health authorities.

In terms of data reporting, we recommend ongoing collection of sales data and reports by calendar year rather than fiscal year. Most other sources of data, such as mortality data and Statistics Canada data, are collected for the calendar year, which will allow for the most accurate comparisons. It would be ideal if main reports could be compiled by April 1st of each year for the prior calendar year and half yearly reports by October 1st.

A question of importance is the extent to which the methodological approach described in this report can be applied to other provinces in order to develop a comprehensive alcohol monitoring system for Canada. Since the systems of collecting and reporting data vary across provinces, the level of detail and accuracy presented in this report may not be feasible in other provinces. As well, the liquor distribution authorities in different provinces may not be as co-operative to release the data. Detailed data on alcohol consumption has been reported in Ontario (Rush et al., 1982) and it is very likely that more detailed data is available in every province.

The data presented in this paper can be used for a variety of research purposes, including the identification of trends and differences between geographic districts

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in per adult consumption, which in turn can lead to generation of hypotheses to explain them. Future work will address the relationships between per adult alcohol consumption and various indicators of morbidity and mortality (see chapter X by Buxton et al elsewhere in this report). Baseline data, such as that presented in this paper, will be helpful in the evaluation of prevention initiatives or changes in alcohol policy. The long-term aim of this project is to provide an open access database on alcohol sales with the level of detail that can be used for a variety of research purposes, such as to examine trends, differences between geographic regions, reasons for those differences, and alcohol-related harms.

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References

- BC Statistics (2006). Population Projections – BC and Regional. Retrieved April 20, 2007, from <http://www.bcstats.gov.bc.ca/data/pop/pop/popproj.asp#admin>
- Health Canada (2004). *Canadian addiction survey: a national survey of Canadians use of alcohol and other drugs*. Prevalence of use and related harms. Ottawa: Canadian Executive Council on Addictions.
- Kerr, W., Greenfield, T., Tujague, J. & Brown, S. (2005). A drink is a drink? Variation in the amount of alcohol contained in beer, wine and spirits drinks in a US methodological sample. *Alcoholism: Clinical and experimental research* 29(11): 2015-2021.
- Macdonald, S., Wells, S. & Giesbrecht, N. (1999). Unrecorded alcohol consumption in Ontario, Canada: Estimation procedures and research implications. *Alcohol and Drug Review* 18: 21-29.
- Ministry of Health of BC. (2007). Death-related Statistics. Retrieved February 5, 2007, from <http://www.vs.gov.bc.ca/stats/annual/2004/pdf/deaths.pdf>
- Rush, B., Macdonald, S. & Giesbrecht, N. (1982). Estimating the Number of Alcoholics in Ontario: An analysis by county. Working Paper Series, Toronto: *Addiction* Research Foundation.
- Statistics Canada. (2003). 2001 Census Dictionary. Retrieved February 5, 2007 from <http://www12.statcan.ca/english/census01/Products/Reference/dict/appendices/92-378-XIE02002.pdf>
- Stockwell, T., Donath, S., Cooper-Stanbury, M., Catalano, P., & Mateo, C. (2004). Under-reporting of alcohol consumption in household surveys: a comparison of quantity-frequency, graduated-frequency and recent recall. *Addiction* 99(8): 1024-1033.

Mapping Substance Use in BC and Canada: A report of the BC Pilot Alcohol
and Other Drug Monitoring Project, 2007

Stockwell, T., Zhao, J., Chikritzhs, T. and Greenfield, T.K. *What did you drink yesterday?* Public health relevance of a recent recall method used in the 2004 Australian National Drug Strategy Household Survey presented in the international research symposium of the Monitoring Alcohol and Other Drug Related Harm: Building Systems to Support Better Policy, May 7 - 10, 2007 Victoria, BC Canada.

Statistics Canada. (2006). *The control and sale of alcoholic beverages in Canada: Fiscal year ended March 31, 2005*. Public Institutions Division System of National Accounts