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A Geographical perspective of the statistical data of and about Greeley, Colorado and its off-premise liquor stores: location, number, and possible saturation

Scott Jones

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A Geographical perspective of the statistical data of and about
Greeley, Colorado and its off-premise liquor stores: location,
number, and possible saturation.

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Capstone Project
for
Master of Science in Geographic Information Science
May 31, 2011

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Abstract

This document, with the use of Geographical Information Systems, will verify that statistically Greeley, Colorado does not contain more than an adequate number of liquor stores within its city limits. This document is intended to give the reader a nonbiased geographical perspective of the statistical data of ~~and about~~ Greeley, Colorado and its off-premise liquor stores: location, number, and if it should be considered over-saturated.

The definition and allotments of a liquor store licenses vary. ~~The three licenses available are~~ Special Event, On Premise, and Off-Premise ~~are the three licenses available and~~. ~~These~~ can commingle. This study was concerned with the license used for sale of full-strength ~~products?~~ by liquor stores, also known as the Off-Premise Liquor License.

This study was conducted as a multi-level independent study using different intensities and manipulations of basic mathematical statistical techniques. The outputs from the aforementioned techniques were converted into databases, map layers and shapefiles, and then projected ~~(combined?)~~ to test the results. The results were then analyzed to test the hypothesis: ~~the~~ ~~city of~~ Greeley, Colorado statistically does not contain more than an adequate number of liquor stores within its city limits.

Using nearest neighbor analysis, it was determined that the hypothesis was valid and revealed that saturation issues are not present. However, due to

the ~~nominal~~ relatively short length of the study, it is recommended that a future study should delve more into the data ~~.- M~~ more detailed analysis and more in-depth research may be required to verify the results ~~once again~~.

The recommended further research should also include analysis of the ~~feelings~~ opinions of the citizens of Greeley, ~~Colorado~~. This research would include questionnaires and polling to get a ~~probability~~ reasonable sampling and the participant's thoughts. (of public opinion?)

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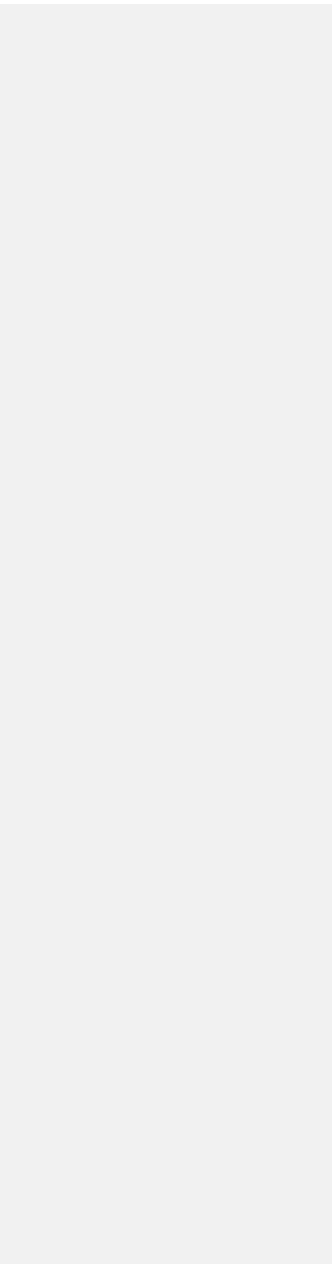
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Disclaimer

This document was written for the purpose of meeting course requirements for the GIS Capstone taught by Professor Steve Hick in association with Professor Frank Orr at the University of Denver. The University of Denver, Professor Hick, Professor Orr, and the author, Scott Jones (University of Denver student) are not to be held responsible or liable for any of the information that may be erroneously presented. This project was produced during a ten-week timeframe; therefore material weaknesses may be present in the design ~~and follow up issues are likely to exist.~~ This report is the property of University of Denver (DU) and its author, Scott Jones. This is purely an educational presentation. ~~No fraud or misrepresentations were nor are intended.~~

Acknowledgement

I would also like to thank the students who paved the way before me. The use of their papers, for reference, made this document easier to complete. Any fraud or plagiarism is purely unintentional and completely accidental.

Introduction

Are There Too Many Stores in Greeley?

Every year, around February and March, a debate resurfaces to amend Colorado State liquor laws. It quietly appears as a major headline in the Greeley Tribune, the local newspaper for Greeley, Colorado. Surprisingly, this is not a local debate. In fact, after further research, it has come to my attention that this is a state-wide debate. To be more exact, the debate starts in the Colorado Legislature and uses the local papers statewide as a forum. The dialog varies from year to year, but its preface is whether or not to amend the State of Colorado's liquor laws. As a citizen of the state of Colorado and City of Greeley, I find it interesting that continued efforts and tax dollars are being used on this topic year after year; laws are meant to be changed for the benefit of the citizens whom are meant to abide by them.

Proposals like this are annual debates at the state level of government. For the last three years, a representative of the State of Colorado has presented a new bill for the allowance of full-strength beer to be sold in grocery stores with pharmaceutical licenses and convenience stores. ~~One of the other most~~Another current debates in the state legislature is whether Colorado (Greeley included) should amend Colorado's liquor laws on the sale of full-strength beer and liquor. Currently in Colorado, spirituous, vinous & malt liquor is available only in liquor stores and liquor-licensed drug stores. The aforementioned liquor stores and liquor-licensed drug stores may only

operate one location, while 3.2% beer may be sold in gas stations, supermarkets, and convenience stores. A small number of grocery stores are licensed as drug stores and sell full strength beer, wine, and spirits (see Appendix D for a sample list.) Alcohol with a percentage of alcohol by volume ~~of~~ greater than 3.2% is what the law refers to as a full-strength alcoholic beverage being sold at an Off-Premise location. (reword - define off premise)

In 2011, Colorado House Representative Larry Liston, a Republican from Colorado Springs, presented House Bill 1186. ~~This~~ bill would have permitted convenience stores of less than 5000 square feet in size to sell full strength beer, instead of 3.2 beer currently ~~permitted~~ allowed to be sold in their stores. Liston co-wrote the bill with five other legislators and members of the Colorado Wyoming Petroleum Marketers Association.

In February 2010, "House Bill 1284 would have amended Colorado's long-standing liquor law, which establishes separate licensing categories for the sale of liquor depending on whether the product being sold contains more or less than 3.2 percent alcohol by volume. HB 1284 proposed doing away with that distinction, thus allowing grocery and liquor stores to sell beer with more than 3.2 percent alcohol by volume. The bill would also have allowed 18-year-olds who have undergone required training to sell beer." ¹

¹ <http://www.scribd.com/doc/52799049/1284-01-2>

During the 2010 debate and hearing, Representative Daniel Kagan wondered aloud, "Why is there a need for this bill?" (Laur 2010)

Liquor Enforcement Division Director Laura Harris pointed out some of the finer points of liquor regulation were not directly addressed in HB1186. She testified that while retail liquor store owners may have one and only one license to sell alcohol, 3.2 licensees enjoy the opportunity to have multiple kinds of licenses. A corporate entity may also own multiple 3.2 licenses - "as many as you like", according to Harris. Under HB1186, "Multiple malt liquor licenses would also be permitted. But it does not change the restriction of Retail Liquor Store licensees, who would still be limited to one store." (Laur 2010) The vote was defeated HB 1186, in an 8-3 vote by the Colorado State House Finance Committee. The measure, which had already been approved by another committee, would have permitted convenience stores to sell "full strength" beer instead of 3.2 beer. Liston had hoped "his protectionist bill would benefit in-store sales for convenience store owners, who have been hurt since July 2008, when Sunday liquor store sales were permitted in Colorado." (Huffington Post 2011)

One of the debate topics revolves around the idea that many people, including alcohol and beer distributors, argue ~~the~~ that the state of Colorado has far too many liquor stores. Yet the argument comes from the customers, grocery store owners, and convenience store owners who are

asking for expansion. Like many towns and cities in northern Colorado, the number of liquor stores appears to be plentiful at first glance ~~—but are they is this true?~~ For example, Greeley, Colorado currently has twenty-two liquor stores ~~—~~there are three that have closed within the last three years with the building that occupied them is still sitting empty ~~—~~and one opening the summer of 2011 ~~—~~All of these stores are within city limits of Greeley.

This document is intended to give the reader a ~~g~~Geographical perspective of the statistical data of and about Greeley, Colorado and its off-premise liquor stores ~~including the~~ location, number, and possible saturation. Using Geographical Information Systems ~~(GIS)~~, this document will verify that Greeley, Colorado statistically does not contain more than an adequate number of liquor stores within its city limits.

Definitions of Liquor Licenses

It is important to note that each state has its own rules and description for the sale of alcohol. For this study it would relative to the rule in force within the state borders of Colorado. The state considers the sale of alcohol to be described as, "... malt, vinous, and spirituous liquors in sealed containers..."²

There are three main liquor licenses; On-Premise, Off-Premise, and Special Event ~~—~~These are describe in more detail below :-

² 1 <http://www.colorado.gov/cs/Satellite/Rev-Liquor/LIQ/1209635768989>

- A Special Event license allows the licensee to sell alcohol to consumers for a set period of time, such as a dance or rodeo. This license is divided into the two categories; On-Premise or Off-Premise.
- On-Premise liquor licenses are intended to allow the owner of the license to sell alcohol to its customers. The alcohol must be consumed on the premise it was purchased at; they are primarily issued to bars and restaurants.
- Off-Premise liquor licenses are intended to allow the owner of the license to sell alcohol to its customers. The alcohol must be consumed off the premise it was purchased; in fact, it is illegal for the customer to consume the recently purchased alcohol unless the retailer has a special tasting license. The tasting license is often purchased by retailers to sample types of alcohol in hope the consumer will buy the product; there is a large liability placed on the retailer to insure the public's safety by limiting the amount allotted to each consumer.

Due to the array of liquor licenses available, this study was intended to test

the ~~sale of~~ Off-Premise liquor license, allowing ~~the licensee is able to~~ sell alcoholic beverages consisting of ~~wine, spirits, and full strength beer.~~

Literature Review

Research on ~~l~~iquor ~~s~~Store ~~s~~Saturation is rather limited. ~~U~~ However, ~~u~~ using ~~the~~ techniques from multiple articles ~~w~~as ~~w~~ere used to analyze the hypothesis. I spent many hours reading newspaper articles, articles online, and journal articles about statistics.

Two of the most interesting literature reviewed were:

- *Spatial Statistics and Modeling*, Springer Series in Statistics, C. Gaetan, X. Guyon
- *Spatial Statistics for Remote Sensing*, Stein, Alfred van der Meer, Freek Gorte, Ben

Both articles ~~pointed out~~described multiple statistical techniques that are available. I decided that using buffers and testing with nearest neighbor scoring would be the best option. ~~Not to mention, B~~both tools are easy to use in ESRI ArcMap's Spatial Tools.

As I mentioned ~~above~~previously, it was easy to find articles about saturation issues, moratoriums, and liquor debates, so I have attached the sources used in the ~~works cited section~~works cited section of this document.

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Design and Implementation

Overall, this study was an easy project to carry out due to its relatively simplistic ~~it had a very simplistic~~ design. The study did not require any special permits or permissions to conduct. Because the study did not involve human interaction, the Institutional Review Boards services were not warranted nor employed. However, if the future research suggested at the end of this document ~~are is~~ conducted, the Institutional Review Board, should be contacted and their input incorporated.

Software

Since this was a multi-level study, for consistency reasons, the same software was used for each of the study's levels. They included:

- ESRI ArcMap10
- ESRI ArcCatalog
- Microsoft Word
- Microsoft Excel
- TextPad

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The Study - Part I

The first study conducted was ~~done performed~~ with the most basic math calculations. The population of each city was divided by total number of stores in the respective city. The results are found in the [Results section](#) just below.

Comment [FO1]: Where is this? It is not called out as such.

Each of the cities in the sample was chosen by its relative location to Greeley, [Colorado](#).

Comment [FO2]: Fix the graphic below - it is cut off.



The first three cities were ~~labeled identified~~ as the "Neighboring Cities" and include:

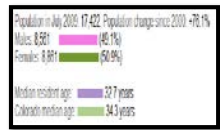
- **Greeley**
 - The controlled variable.
 - Is located in Weld County, Colorado.
 - Has an area of 30 sq mi
 - In July 2009, it was estimated that Greeley had a population of 92,625 people.
 - Greeley has twenty-two Off-Premise Liquor stores.

Comment [FO3]: Is Greeley a neighbor city to itself?

Comment [FO4]: Graphics are hard to read.



- Windsor
 - Dependent variable number one.



- o Is located in Weld County, Colorado.
- o Has an area of 14.9 sq mi
- o Windsor is a smaller town from Greeley.
- o The demographics of both cities are very similar.
- o It has a smaller population than Greeley.
 - In July 2009, the population was estimated at 17,422 people.
- o Windsor has seven Off-Premise Liquor stores.



Comment [F05]: Move this graphic.

• Loveland

- o Dependent variable number two
- o Is located in the Larimer, County, Colorado
- o Has an area of 25.5 sq mi
- o Loveland is a smaller town about 20 miles to the west of Greeley.
- o Is sometimes referred to as a "Sister City" of Greeley.
- o The demographics of both cities are very similar.
- o It has a smaller population than Greeley.
 - In July 2009, the population was estimated at 66,215 people.
- o Loveland has twenty-three Off-Premise Liquor stores.



Comment [F06]: This graphic looks to have been shrunk in the horizontal, not proportionally.

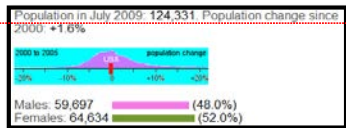
<http://www.wyodot.com/wyodot/wyodot.html>

Comment [F07]: What is this hyperlink below?

Once again, the next three cities were also chosen because of their geographical location. All three cities are labeled "Neighboring Cities outside of Colorado" in the charts. They include:

• Topeka, Kansas

- o Outside of Colorado dependent variable number one.
- o Topeka is a larger town about 580 miles to the east of Greeley.
- o The demographics are quite different similar.
 - Greeley has a large Hispanic population.
 - Topeka has a large African-American Population.
- o It has a smaller population than Greeley.



Comment [F08]: Different graphics than above.

- o This process was long and met with some concern and nominal hesitation by the receiver of the phone call.
- o Once again, it is highly recommended that the researcher retrieve more accurate data to improve the validation of similar or future studies.
- The population data
 - o Citi-data.com was used to get data.
 - o Cross-referenced with US Census data.
 - o Citi-data.com data was used as the source for population.
 - o The data was simply the most current population of each respective the city.
 - o This data was recorded on an excel spreadsheet. I have attached the population numbers for all of the sample cities.

Maybe a chart here would be good?

I have added maps (where?) showing the locations of liquor stores in each ~~respective~~ city. The location of each liquor store is placed geographically on maps provided. Because most of these sites are advertising companies, they proved to be a quick way to get the number of stores. ~~How~~ However, quickest is not always the most accurate. It is recommended that the any researcher doing further ~~research study~~ should contact the respective city's liquor board for the most accurate ~~and actual~~ number of stores for each ~~respective~~ city. As you will see, the data ~~quickly~~ provided a initial picture that suggests that Greeley may not over-saturated with liquor stores. But does using a small sample of cities give the researcher ~~an~~ accurate ~~output~~ results?

WHERE ARE THE RESULTS YOU REFER TO IN THE PARAGRAPH ABOVE?

Does everything HAVE to go in the results section? I should read my capstone guide!

The Study Part II

Because the first study produced a questionable output (questionable, or just based on too little evidence?) that did not entirely produce a definitive answer, a second study was conducted with a larger sample (which can be found in Appendix A.) This study further scrutinized the data in hope of rendering a more thorough statistical output.

The sample database included over fifty cities located across the United States. The cities were chosen by random location (how did you achieve randomness?) in the forty-eight contiguous states of the United States of America. ~~—~~Hawaii and Alaska were purposely left out of the study.

The most recent population data was collected from city-data.com and entered into a database very similar to Study I's database. Once again, the data collected was analyzed against Greeley's population to address the over-saturation theory.

~~Once again~~As before, this data was assimilated into a database that was used for analysis that was very similar but had more cities:

- The Stores
 - Were located via the internet.
 - The store name and address were verified by phone.
 - This information was generated from multiple phone directories and webpages.

- While it would have been far more credible to get the list from each city's government or liquor board, it just proved to be far too time consuming;
 - Most of the cities wanted me to put the request in writing and send a self-addressed stamped envelope.
 - This process was long and met with some concern and nominal hesitation by the receiver of the phone call.
 - Once again, it is highly recommended that the researcher retrieve more accurate data to improve the validation of similar or future studies.
- The population data
 - Citi-data.com was used to get data.
 - Cross-referenced with US Census data.
 - Citi-data.com data was used as the source for population.
 - The data was simply the most current population of each respective the city.
 - This data was recorded on an excel spreadsheet. I have attached the population numbers for all of the sample cities.

The data was further scrutinized and manipulated with the following

statistical mathematic techniques:

- Average
 - An average, or central tendency of a data set is a measure of the "middle" value of the data set:
- Mean
 - In statistics, mean has two related meanings:
 - The arithmetic mean (and is distinguished from the geometric mean or harmonic mean).
 - The expected value of a random variable, which is also called the *population mean*.
- Mode
 - The mode is the value that occurs most frequently in a data set or a probability distribution.
 - In some fields, notably education, sample data are often called scores, and the sample mode is known as the modal score.
- Median
 - A median is described as the numeric value separating the higher half of a sample, a population, or a probability distribution, from the lower half.
 - The median of a finite list of numbers can be found by arranging all the observations from lowest value to highest value and

picking the middle one. If there is an even number of observations, then there is no single middle value; the median is then usually defined to be the mean of the two middle values.

The average, mean, median, and mode were calculated for each city of the sample. [\(Don't you mean for the whole sample of 50 cities?\)](#) The results were compared to Greeley and recorded into a sample database worksheet.

The outputs of the manipulations [\(more details\)](#) were added to the new database, which contained all of the new cities. The results for Part II were generated, and they can be found in the [Results section](#) below.

The Study Part III

In Part III of the study, it was deemed important to get more information that could be more easily understood. Once again, a new database was orchestrated-constructed using data about the City of Greeley. This time the list contained the name and location of the stores from multiple directories; secondly, the data was verified with Cheryl Aragon (w ho?); it was easy to validate the number of liquor store in Greeley.

This database contained the following attributes ~~and recorded:~~

- Name
- Address
- City
- State
- Latitude
- Longitude

After generating the database, I imported the data into ESRI's ArcMap10. The data was not readable, so I applied a Geo-coding tool find the correct latitude and longitude coordinates. Once the tool was run, it generated the new addresses with the correct latitude and longitude. (Alternatively, an analyst can use the Display XY Data tool that assigns "X" and "Y" to the latitude and longitude coordinates if they are present; this creates a layer file that can be projected onto the map as well.)

After the data was projected onto the map georeferenced and displayed in ArcMap, the next tool employed was the buffer tool. I requested-opted for a one-mile distance as the buffer to be generated around each store. This was

used to visually test the saturation question. This distance was determined by a guideline the City of Greeley suggests as the recommended distance ~~recommended~~ between stores. ~~The data was retrieved-collected~~ in a brief phone interview with Cheryl Aragon, the City of Greeley's Liquor Board Manager. She was unable to give exact specifications, but commented that the Liquor Board urges new owners to ~~be~~ locate new stores around one mile ~~away~~ from any of the other liquor stores.

While setting ~~up~~ the buffer, I decided it was best to use one half of a mile as the desired distance as opposed to the recommended one mile distance; this would give me a ~~circumference-diameter~~ of one mile. I felt that a one-mile ~~diameter circumference~~ was more logical and feasible in a town that has a 30 square mile ~~area-not area. Not~~ to mention, it would generate a more than adequate result when testing the saturation of the stores with such a small area of interest. In fact, the results of this study proved that the one mile ~~diameter circumference~~ buffer was more than enough distance of the buffer between each store. Is this demonstrated later on?

These were the steps employed, to ~~orchestration create~~ the buffer layer ~~and~~ process the projection of the maps ~~and for testing for for~~ visual saturation:

1. Develop ~~d~~ database sheets from Microsoft Excel Sheetsworksheets.
 - o Using the data existing data

- o Imported into ESRI ArcMap 10
 - o Using ESRI ArcCatalog the addresses for the stores were run through a ~~g~~Geo-coding ~~M~~atching tool.
2. Three layers were created with ArcMap 10
- o Existing Stores in Greeley
 - o Stores Located in Greeley but have an Evans address
 - Evans is the sister city to Greeley.
 - o Stores that have closed within the last three years of 2011 (the date of the study.)
 - o Stores that are under construction.
3. ~~Projected Georeferencing~~ the locations of each store using latitude and longitude coordinates. ~~(Wait, did you geocode AND create points from XY locations? Why?)~~
4. Finally, using the buffer tool, a one ~~half~~ mile buffer was created.
- o The circles in the maps below reveal a ~~half~~ mile radius.
 - o The circles in the maps below reveal a 1 mile ~~circumference diameter~~.

The outputs of the ~~manipulations-geoprocessing~~ were added to the new database, which contained all of the new cities. The results for Part III were generated, and they can be found in the [Results section](#) below.

Results of the Capstone Study

Study I

The Number of Liquor Stores

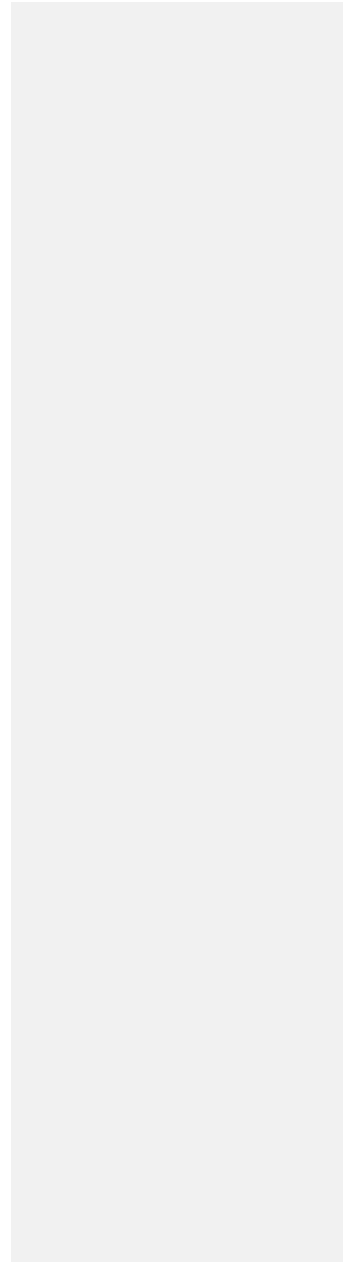
The first study's output was quite ~~limiting~~. It was generated from a small sample of cities ~~and~~ compared to Greeley, Colorado. The information retrieved was merely the number of stores per person. ~~If~~ the total number of liquor stores is divided by the population for each city³.

The results ~~would prove to be adequate in answering and appeared to~~ validate~~ing~~ the hypothesis, but left me wondering how valid these results were. For example, the total number of liquor stores in cities ~~of in~~ Colorado is quite high compared to Albuquerque, New Mexico, but in line with Cheyenne and Topeka. In fact, it appears that both Loveland and Windsor, the two closest cities in the study to Greeley, ~~has have~~ almost twice as many people per store: ~~(maybe a table here would be good instead of the bullets below?)~~

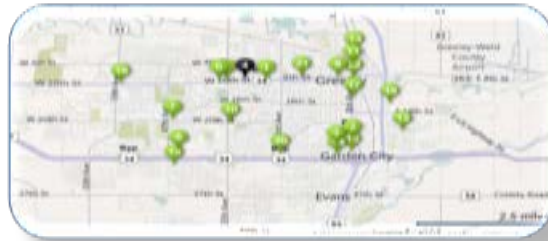
- Greeley
 - Greeley
 - Has twenty-two Off-Premise liquor stores.
 - This is one liquor store for every 4,211 residents.
- In comparison to Greeley's neighboring cities:
 - Loveland
 - Has twenty-three stores.
 - This is one liquor store for every 2,879 residents.

³ The data provided was borrowed from City-data.com. The population for the cities Greeley, Colorado, Loveland, Colorado, Windsor, Colorado, Topeka, Kansas, and Albuquerque, New Mexico was as of July, 2009. The population for the city of Cheyenne, Wyoming was as of July, 2007. For more information about the population data sets please visit <http://www.city-data.com/>.

- o Windsor
 - Has seven stores.
 - This is one liquor store for every 2,489 residents.
- Outside of Colorado:
 - o Topeka, Kansas
 - Has twenty-two stores.
 - This is one liquor store for every 5,651 residents.
 - o Cheyenne, Wyoming
 - Has twenty-two stores
 - This is one liquor store for every 2,552 residents.
 - o Albuquerque, New Mexico
 - Has ten stores.
 - This is one liquor store for every 52,850 residents.



The Location and Number of Liquor Stores in Greeley, Colorado

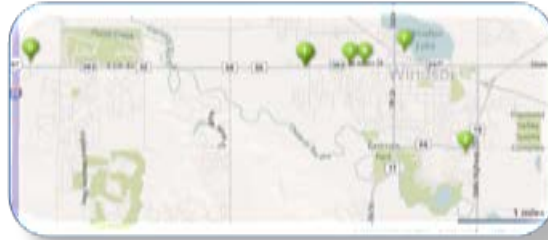


Comment [F010]: Where did these maps come from?

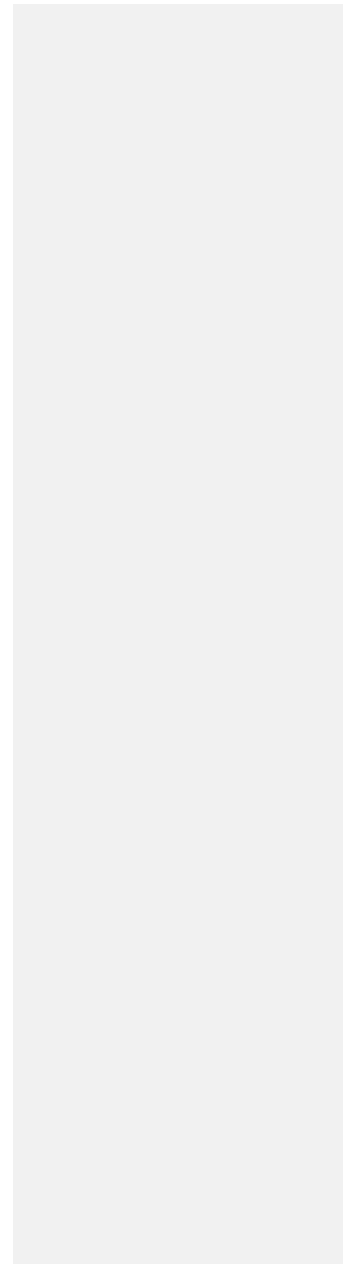
The Location and Number of Liquor Stores in Loveland, Colorado



The Location and Number of Liquor Stores in Windsor, Colorado



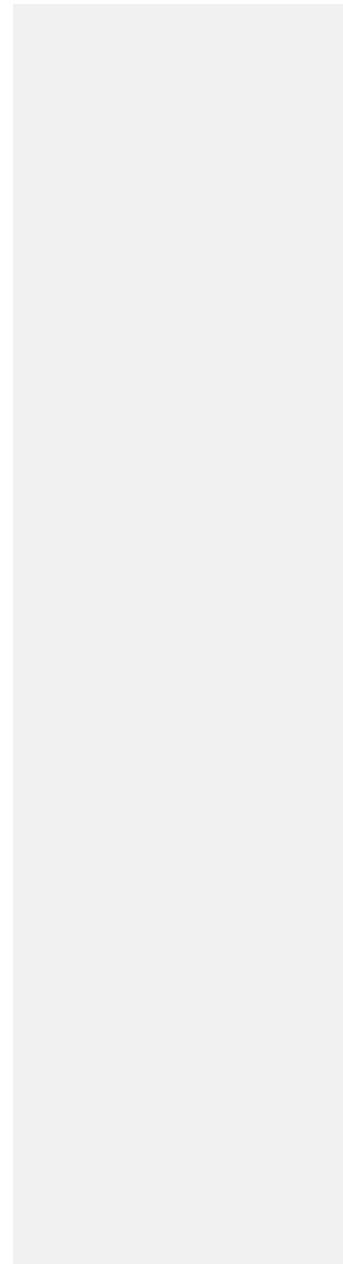
The Number and Location of Liquor Stores in Topeka, Kansas



The Location and Number of Liquor Stores in Cheyenne, Wyoming



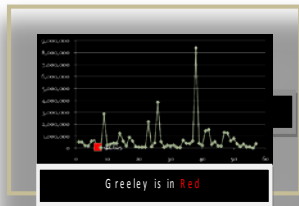
The Location and Number of Liquor Stores in Albuquerque, New Mexico



Study II:

Study II involved using a few more simple statistical techniques. The data was compiled of over fifty city's data and generated comparisons to the sample cities; the results can be seen **below**:

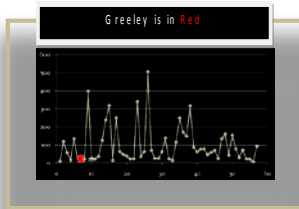
Comment [FO11]: Where did these charts come from?



Population of the sample cities

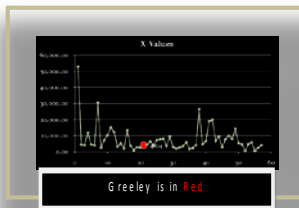
- **Average**
703,677 people
- **Mean**
187,938.5 people
- **Mode**
N/A people (no repeating numbers)
- **Median**
372,186 people

Comment [FO12]: How are you defining the average and the mean? Should they be so different?



Number of stores per sample city.

- **Average**
99 stores
- **Mean**
38.5 stores
- **Mode**
22 stores
- **Median**
62 stores



Number of stores per person in sample city.

- **Average**
7,917 people/store
- **Mean**
4,644.8 people/store
- **Mode**
N/A people/store
- **Median**
4,744 people/store

Red

Greeley compared to the sample cities:

- **For Most Stores**
 - 47th out of 57 cities.
- **For Population**
 - 52nd out of 57 cities.
- **For Stores per person**
 - 22nd out of 57 cities.

Comment [F013]: So no geographical element in Study II?

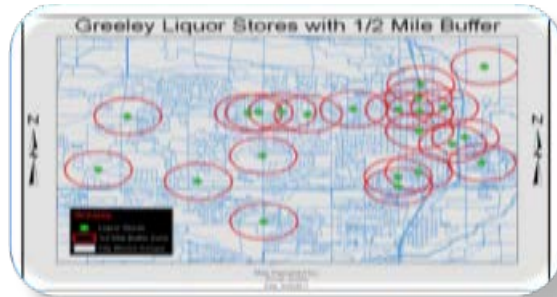
Study III:

The two maps below, [Existing Liquor Stores with buffer](#) and [Greeley and Evans plus Closed or Proposed Stores](#), are very similar. However, the first map ([Existing Liquor Stores with Buffer](#)) shows only the stores with a Greeley address, while the second map ([Greeley and Evans plus Closed or Proposed Stores](#)) shows all of the stores in Evans with a Greeley address, a new store under construction, and stores that have been closed in the last three years. When both maps are shown it ~~reveals-yields~~ a more revealing picture. [Why?](#)

The database ~~reveals-contains~~ the addresses of each store, ~~but~~ [displaying the locations](#) using ~~the GIS applications with~~ ArcMap clearly shows that there are quite a few [\(how many? You may get to this later on\)](#) stores within a one half mile radius of each other (especially downtown and eastern Greeley and Evans.)

Comment [F014]: I would suggest losing all the hyperlinks.

Existing Liquor Stores with **buffer**



Comment [F015]: Map are a little simplistic.

[Return to text](#)

Greeley and Evans plus Closed or **Proposed** Stores



Comment [F016]: Map too small - hard to read.

Average Nearest Neighbor

Just looking at the map did not reveal whether the areas [features? Distribution?](#) are clustered, random, or dispersed, so I used the Average Nearest Neighbor tool. [How is this related to Studies I and II?](#) With this tool I was able to "measure the distance between each feature centroid and its nearest neighbor's centroid location." (ESRI 2010) I have included a detailed description of Average Nearest Neighbor ~~for from~~ the ArcMap 10 ~~help window~~ [Online Help](#):

"It then averages all these nearest neighbor distances. If the average distance is less than the average for a hypothetical random distribution, the distribution of the features being analyzed is considered clustered. If the average distance is greater than a hypothetical random distribution, the features are considered dispersed. The average nearest neighbor ratio is calculated as the observed average distance divided by the expected average distance (with expected average distance being based on a hypothetical random distribution with the same number of features covering the same total area)." (ESRI 2010)

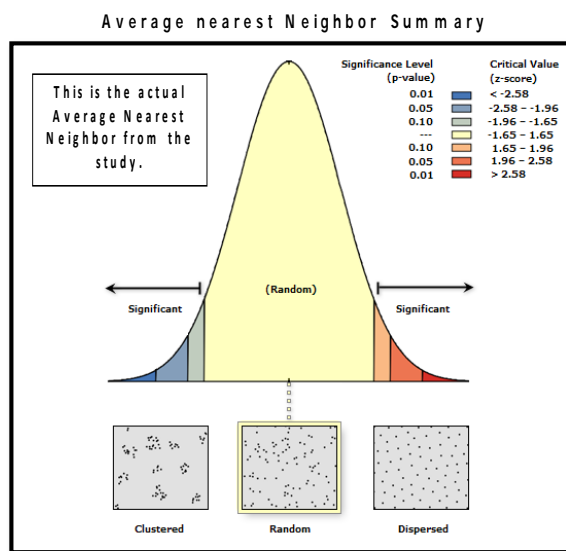
Interpretation

"If the index (average nearest neighbor ratio) is less than 1, the pattern exhibits clustering. If the index is greater than 1, the trend is toward dispersion.

The equations used to calculate the average nearest neighbor distance index (1) and z-score (4) are based on the assumption that the points being measured are free to locate anywhere within the study area (for example, there are no barriers,

and all cases or features are located independently of one another). The p-value is a numerical approximation of the area under the curve for a known distribution, limited by the test statistic.

The z-score and p-value for this statistic are sensitive to changes in the study area or changes to the Area parameter. For this reason, only compare z-score and p-value results from this statistic when the study area is fixed.' (ESRI 2010)



Output

*The Average Nearest Neighbor tool returns five values: observed mean distance, expected mean distance, nearest neighbor index, z-score, and p-value. These values are accessible from the Results window and are also passed as derived output values for potential use in models or scripts. Optionally, this tool will create an HTML file with a graphic summary of results. Double-clicking the HTML file in the Results window will open the HTML file in the default Internet browser. Right-clicking the Messages entry in the Results window and selecting View will display the results in a Message dialog box. (ESRI 2010)

~~Once again~~ this is the actual Average Nearest Neighbor data summary from the study

Average Nearest Neighbor Summary	
Observed Mean Distance:	0.007578
Expected Mean Distance:	0.007496
Nearest Neighbor Ratio:	1.010992
z-score:	0.105141
p-value:	0.916264
Dataset Information	
Input Feature Class:	Existing Liquor Stores
Distance Method:	EUCLIDEAN
Study Area:	0.005619

Part Four: Discussion

Reviewing the Average Nearest Neighbor Data, which reveals that the liquor stores are randomly placed throughout the city of Greeley, it was apparent that the liquor stores have been favorably placed geographically; the Z scores are well below "1". So statistically, the hypothesis is valid but is it by luck? (Wait, the hypothesis was that there is not over-saturation of liquor stores in Greeley. All you have proved here is that the location of the liquor stores are more or less randomly distributed.)

On a side note, I interviewed Kenneth Brownlee, the previous part-owner of American Spirit Wine, which closed in 2009, about the process of opening a store. He stated that the stores do not have to provide a reason for the location for the new store just the building plans and the proposed location. According to Mr. Brownlee, "... the process was very simple, and that the placement of the new store location was never questioned." Is it important to analyze whether this has been blind-luck over the years with the random placement of the stores? Or have the owners of the new stores analyzed the locations?

Even though the hypothesis is statistically proven to be valid, (Really?) can the subjective question, whether or not the city of Greeley is over-saturated with liquor stores, may need to be answered directly by the citizens of Greeley. I couldn't help but ask myself, "What the citizens want?" With this question looming, I decided to suggest an alternative proposed study and

questionnaire that could give closure and resolution to this annually debated issue.

Doing What the Citizens Want!

Currently, the decision whether to or not to grant a liquor store a license is decided by the local liquor division of both the state and city the location of the store is located in. Unless ~~there~~ there is a large amount of opposition against the liquor store, then the license is granted. In Greeley, ~~Colorado~~ only two licenses in 20 years have been declined. Is a better process desired by the citizens of Greeley? This study would address whether a sample of citizens of Greeley want a moratorium to govern the rulings and issuance of liquor licenses.

During the ten weeks of this study, several new stores have opened and one is advertising its opening is coming soon. A list generated from the city of Greeley's Liquor department should be included to add any pending future stores to the study. Upon speaking with Cheryl Aragon, it became apparent that this is a public document.

Areas of Further Research

The Type of Further Study Recommended

The type of research study recommended would incorporate a ~~probability~~ sampling of the citizens of Greeley. This sample set of question in the capstone sample questionnaire below is quite limited, but could give a good idea of the general ~~census opinions~~ of ~~the~~ citizens of Greeley ~~regarding this issue, Colorado~~. Secondly, in order to receive candid and honest responses, it is recommended that the questionnaire be voluntary ~~(then it is a self-selecting sample group, which can cause issues)~~ and confidential.

Furthermore, it would be imperative to set-up multiple locations for data retrieval (conducting the questionnaire and study.) Carefully chosen demographic~~a~~ locations strategically located ~~-~~ (For example, near the University of Northern Colorado Campus, ~~and~~ the Recreation Centers~~s~~ on the east and west side of Greeley.

In order to avoid generalization, a much larger sample is suggested ~~-~~. ~~H~~opefully, the city would give permission to post the questionnaire on the city's website.

Questionnaire Summary

The questionnaire would need to educate and address questions. The questionnaire could be simple with a brief description of the intent of the questionnaire. For example:

What is a moratorium? Basically, a moratorium is a formally agreed upon period of time in which an activity is put on hold. In this case, a moratorium would be placed on the allotment of license issued to applicants wanting to open a new store. In most cases, the moratorium would be in effect until the City of Greeley, feels that a new store is warranted by public demand. (Don't lay out too much info or people will steer their responses toward what they think you want. Best to keep the questions simple and agnostic.)

I have included a sample of questions that would need to be addressed. The importance and relevance of each question, is briefly pointed out after each question just below. However, the brief explanation of each question would only ~~and~~ appears in this section, and would not be part of the questionnaire. However, a copy of the questions and their importance and relevance could be made available upon request to help further educate the participant. I have attached a copy of the proposed questionnaire on Appendix C in this document. This could get very confusing. Best to keep it simple.

Here are the sample questions and their importance and relevance:

- **Are you a citizen of Greeley, Colorado?**
 - Obviously this question must be included in the questionnaire.
 - The citizens should have the vote on this issue.
- **Are you 21 years old?**
 - The legal age is 21 years of age in Colorado.
 - Only people who are above the legal age limit should have the right to determine the effects of this proposed law.

- Do you drink alcohol beverages like Beer, Wine, or Spirits -also known as hard liquor? If you respond ~~no~~ **No** please skip to **Question 5.2** ~~(They are not numbered.)~~
 - This question can provide a biased opinion both for and against the study. The output should be analyzed:
 - Those who drink.
 - Those who do not drink.
 - It is vital to avoid discounting either response.
- Do you prefer to drink at a bar, at home, or with friends at a social gathering?
 - Once again this data would provide with three more possible **manipulations**:
 - Those who drink at:
 - Bars
 - At home
 - Or with Friends
 - Not to mention, additional questions or **manipulations** of data about those who only drink in one of the location.
- Do you think Greeley, Colorado has too many liquor stores?
 - This is the basis of the study and the questionnaire.
 - This is a set-up question for the next several questions.
 - Because it can control the output of the data, it is vital this question is answered.
- How many liquor stores do you think Greeley, Colorado has?
 - This answer makes the question less subjective.
 - The question is could be perceived as ambiguous. This was done on purpose. The answer to the previous question and the answer to this question will undoubtedly have many answers. This data can be manipulated multiple way again.

Comment [F017]: What does this mean?

Comment [F018]: Do you mean analysis?

- Do you know what a moratorium is and what it is intended to do? (If you do not know what a moratorium is please see the description at the top of the questionnaire.)

- This question would serve as an educational and informative piece to the questionnaire.
 - Do they want one?
 - Do they even know what one is?
- Once again this question would provide many variables for manipulation.

- Do you think city officials of Greeley, Colorado should limit the number of liquor stores within its city limits? Why or Why not?)

Comment [FO19]: Keep it simple. Yes or no.

-
- This question is important to get a feeling of the participant's political beliefs. It sets-up the next question.
 - It gives the participant a chance to be heard.

- Do you think city officials of Greeley, Colorado should distribute license on a preset needs basis? (For example so many stores per citizen?) Why or Why not?)

Comment [FO20]: Ditto.

- This question is an attempt to get the participant involved in future decisions.

- Comments or ideas you would like to

add: -----

- This is a section for the participant to make suggestions and could be helpful to the researchers.)

Comment [FO21]: Avoid if possible.

Recommended Analysis of the Future Study's Findings.

The questionnaire sample would be gathered after a set amount of time and/or number of questionnaires gathered; however it could prove difficult to set an exact number of questionnaires, but a reasonable percentage of the total population would need to be set. The calculations would be:

- Divide the total number of questionnaires participants by total number of citizens of Greeley.
- Total people in the sample "for" a moratorium.
- Total people in the sample "against" a moratorium.

This questionnaire would allow for an explanation of why the city should impose a moratorium. The sample would be limited to only those willing to take the questionnaire (again, probably not a representative sample), but if presented properly, it would give a sample of the city of Greeley's general population's opinion.

Further research should include making contact with each city's liquor division to verify the exact number of existing liquor stores; however, the same data retrieval and methods were could be used for the comparison.

Appendix A:

Cost of Off-Premise Liquor Licenses

Because the cost of a license varies from a few thousand dollars or tens of thousands of dollars, it is important to understand what a license costs and how a moratorium could benefit the license owner.

The costs of an Off-Premise Liquor license vary from state to state. For example, without a moratorium most any applicant can get one for as little as a few thousand dollars. According to the Department of Revenue Liquor and Tobacco Enforcement Division's Liquor Fee Schedule, it would cost the applicant an initial fee of \$2,275. Most states fees are the same, for example, the State of Kansas, Department of Revenue's Liquor Fee Schedule-KS shows very similar fees; this same license would run around \$2,550.⁴

However, some states have issued moratoriums on the issuance of license, which increases the value of the license. Some experts argue, if a moratorium is put in place the owner of the license has a tangible piece of paper with a greater value; limited licenses can cause economic supply and demand. Others argue that the liquor stores already have a monopoly. (Huffington Post 2011)

⁴ <http://www.ksrevenue.org/abcoffprem.htm>

Appendix B:

Sample Cities for Part II of the Study

Name	Number of stores	Pop	(*)	(/)	
Albuquerque	10	528,497	5,284,970	52,849.70	52,849.00
Atlanta	119	519,145	61,778,255	4,362.56	4362
Birmingham	57	229,800	13,098,600	4,031.58	4031
Boise	17	202,832	3,448,144	11,931.29	11931
Boston	134	599,351	80,313,034	4,472.77	4472
Boulder CO	24	93,552	2,245,248	3,898.00	3898
Charlotte	22	671,588	14,774,936	30,526.73	30526
Cheyenne	21	53,011	1,113,231	2,524.33	2524
Chicago	398	2,851,268	1,134,804,664	7,163.99	7163
Chorpus					
Christi	28	287,438	8,048,264	10,265.64	10256
Cincinnati	22	333,013	7,326,286	15,136.95	15136
Cleveland	36	438,042	15,769,512	12,167.83	12167
Colo Springs	125	399,827	49,978,375	3,198.62	3198
Dallas	238	1,240,499	295,238,762	5,212.18	5212
Denver	318	588,349	187,094,982	1,850.15	1850
Des Moines	15	196,998	2,954,970	13,133.20	13133
Detroit	250	916,952	229,238,000	3,667.81	3667
El Paso	63	606,913	38,235,519	9,633.54	963
Fort Collins	47	138,736	6,520,592	2,951.83	2951
Gary	37	96,429	3,567,873	2,606.19	2606
Greeley	22	90,306	1,986,732	4,104.82	4104
Green Bay	23	101,351	2,331,073	4,406.57	4406
Houston	339	2,208,180	748,573,020	6,513.81	6513
KC KS	35	142,320	4,981,200	4,066.29	4066
KC MO	63	450,375	28,373,625	7,148.81	7148
LA	504	3,831,868	1,931,261,472	7,602.91	7602
Las Vegas	70	558,880	39,121,600	7,984.00	7984
Lawrence Ks	25	89,852	2,246,300	3,594.08	3594
Lincoln	26	248,744	6,467,344	9,567.08	9567
Little Rock	62	187,452	11,622,024	3,023.42	3023
Louisville	138	256,231	35,359,878	1,856.75	1856
Loveland	23	64,429	1,481,867	2,801.26	2801
Manhattan, KS	15	51,707	775,605	3,447.13	3447
Memphis	115	674,028	77,513,220	5,861.11	5861

Comment [F022]: This needs to be more clear!
What are you trying to do here?

Miami	250	409,719	102,429,750	1,638.88	1638
Minneapolis	171	377,392	64,534,032	2,206.97	2206
Milwaukee	148	604,133	89,411,684	4,081.98	4081
New York City	317	8,391,881	2,660,226,277	26,472.81	26472
Oakland	86	401,489	34,528,054	4,668.48	4668
Orlando	61	227,907	13,902,327	3,736.18	6736
Philadelphia	77	1,449,634	111,621,818	18,826.42	18826
Phoenix	78	1,552,259	121,076,202	19,900.76	19900
Pittsburgh	46	311,647	14,335,762	6,774.93	6774
Portland	58	550,396	31,922,968	9,489.59	9489
Rochester	70	206,759	14,473,130	2,953.70	2953
Salt Lake City	24	183,171	4,396,104	7,632.13	7632
San Antonio	134	1,328,984	178,083,856	9,917.79	9917
San Diego	161	1,266,731	203,943,691	7,867.89	7867
Seattle	43	617,334	26,545,362	14,356.60	14356
SF	154	815,358	125,565,132	5,294.53	5294
St Louis	78	356,587	27,813,786	4,571.63	4571
Syracuse	30	139,079	4,172,370	4,635.97	635
Tampa	71	336,823	23,914,433	4,743.99	4743
Topeka	22	122,642	2,698,124	5,574.64	5754
Waco	21	122,222	2,566,662	5,820.10	582
Windsor	7	17,310	121,170	2,472.86	2472
Wichita	92	372,186	34,241,112	4,045.50	4045

Appendix C:

The Proposed Study: Questionnaire

The following questionnaire will be submitted to the general population to determine if a moratorium is warranted:

Is the City of Greeley Over-Saturated with Off-Premise Liquor Stores?

What is a moratorium? Basically, a moratorium is a formally agreed upon period of time in which an activity is put on hold. In this case, a moratorium would be placed on the allotment of license issued to applicants wanting to open a new store. In most cases, the moratorium would be in effect until the City of Greeley, feels that a new store is warranted by public demand.

1. Are you a citizen of Greeley, Colorado?
2. Are you 21 years old?
3. Do you drink alcohol beverages like Beer, Wine, or spirits aka hard liquor? If you respond no please skip to question 5?
4. Do you prefer to drink at a bar, at home, or with friends at a social gathering?
5. Do you think Greeley, Colorado has too many liquor stores?
6. How many liquor stores do you think Greeley, Colorado has?
7. Do you know what a moratorium is and what it is intended to do? (If you do not know what a moratorium is please see the description at the top of the questionnaire.)
8. Do you think Greeley, Colorado should limit the number of liquor stores within its city limits? Why or Why not?
9. Do you think Greeley, Colorado should distribute license on a preset needs basis? For example so many stores per citizen? Why or Why not?
10. Comments or ideas you would like to add:-----

Appendix D:

Some Colorado grocery/chain stores with full-strength liquor licenses

Albertsons, 7450 S. University Ave., Centennial
Alfalfa's Market 1651 Broadway, Boulder
Cost Plus World Market, 2500 E. First Ave., Denver
Costco Wholesale, 7900 W. Quincy Ave., Denver
King Soopers, 4600 Leetsdale Drive, Glendale
Kmart Supercenter, 1400 E. 104th Ave., Thornton
Rite-Aid (dba Keg Liquors), 2870 S. Colorado Blvd., Denver
Safeway, 181 W. Mineral Ave., Littleton
Sam's Club, 4827 S. Wadsworth Way, Denver
SuperTarget, 4301 E. Virginia Ave., Glendale
Whole Foods (dba Merchant of Vino) (closing Saturday),
7400 E. Hampden Ave., Denver

Read more:

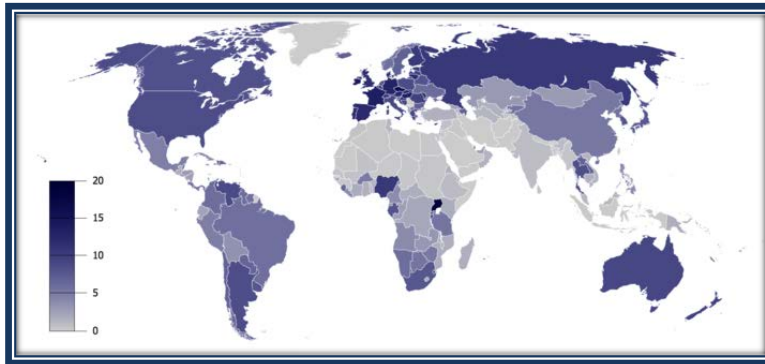
http://www.coloradodaily.com/ci_18101086#ixzz1NV1W8IZG

Coloradodaily.com

Appendix E:

Comment [F023]: Interesting. But how is this really germane?

Alcohol consumption per capita (age 15 or older), per year, by country, in liters of pure alcohol.



http://www.who.int/entity/substance_abuse/publications/global_status_report_2004_overview.pdf

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