

Vermont Alcohol & Tobacco Retailer Location Assessment

Vermont Department of Health Investigation into High School Substance Use by County

Background

For the past 15 years, Vermont has ranked among the five healthiest states in the country when considering 33 core health measures. In the most recent 2018 assessment, Vermont was again rated the fourth healthiest state due to its low air pollution (5.2 micrograms of fine particles per cubic meter, 4th), violent crime (1.66 per 100,000 population, 2nd), uninsured rate (4.2%, 3rd), infant mortality (3.9 per 1,000 live births, 1st), and high scores on other health metrics. However, Vermont scores less highly when it comes to other measures such as pertussis (46.5 per 100,000 population, 50th), disparity in health statuses (33.8% difference, 47th), excessive drinking (19.5% of adults, 30th), and smoking (15.8% of adults, 19th).¹ In 2012 the state launched the Healthy Vermonters 2020 initiative to set targets for various flagging metrics such as drinking and smoking rates among adults and teenagers. Of particular interest was the reduction in the percent of students in grades 9-12 who engaged in binge drinking in the past 30 days from 21% to 15%, the percent of students in grades 9-12 who smoke cigarettes from 15% to 10%, and the percent of students in grades 9-12 who use e-cigarettes from 15% to 12%.² Youth substance use rates are assessed via the Vermont Youth Risk Behavior Survey (YRBS), a semiannual evaluation developed by the Centers for Disease Control and Prevention to monitor common health risks amongst youths.³

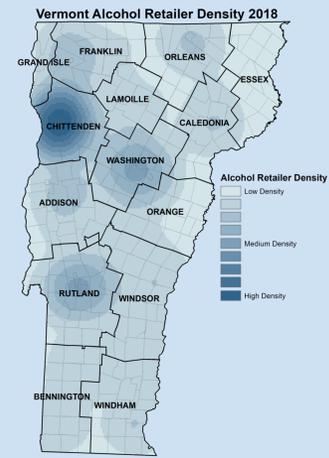
To better understand how to meet these goals, the Vermont Department of Health (VDH) conducted an in-person survey of all retailers in the state, documenting the type of retailer, the products they stock, and their product advertising practices. Of great importance to this effort was to document the location of these retailers and calculate their proximity to one another. Previous literature has shown that alcohol retailer density is associated with excessive alcohol consumption and that limiting the density of retailer may reduce harm.⁴ Furthermore, high tobacco retailer density has been associated with increased youth smoking initiation and high density of retailers in neighborhoods with schools was associated with higher high school smoking prevalence.^{5,6} The goal of this study was to examine the relationship of alcohol and tobacco retailers on youth drinking and smoking rates in order to better support the Health Vermonters 2020 initiative.

Methodology

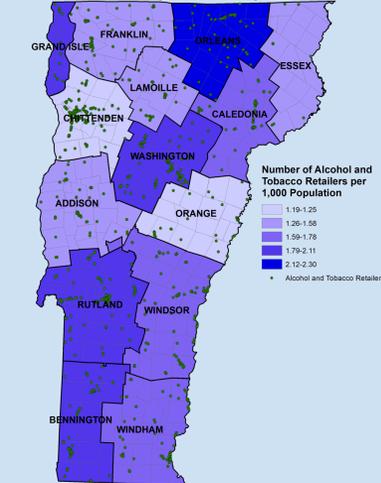
The primary data source of this project was the assessment of alcohol and tobacco retailers performed by the VDH from late 2017 to early 2018. These data were collected by VDH employees and each row contains the findings from in person assessment of a retailer. These assessments included 60 binary variables recording the alcohol and tobacco products offered, advertising methods, and product placement, as well as four cost variables. Another datafile provided by the VDH was also record of all alcohol and tobacco retailers in VT from the same period. This file included latitude and longitude coordinates for each retailer as well as demographic quintiles for each of retailers. Another major source of data was VT county YRBS reports from the 2017 survey. Metrics from these 14 reports on high school substance use were combined and incorporated into an additional spreadsheet documenting the health outcomes for each county. Also incorporated into this county spreadsheet were overall 2017 county population figures from the US census bureau. The final data source was the Vermont Center for Geographic Information (VCGI), which provided additional GIS variables including school locations, roads, and county boundaries. All the sources used were of moderate to high quality. Many of the variables included in the VDH files were not utilized and many had a high proportion of missing information.

These data were added to a general Vermont state map utilizing the GCS North American 1983 geographic coordinate system and the NAD 1983 State Plane Vermont FIPS 4400 projected coordinate system. County level YRBS and population data were joined to the county shapefile and retailers were plotted on the map according to latitude and longitude coordinates. Spatial joins were performed to associate YRBS and retailer data with the appropriate county. Buffers were established both to examine the number of retailers in proximity to schools and to display road accessibility around retailers. Finally, kernel density maps were created to examine areas with the highest concentrations of alcohol/tobacco retailers. These operations resulted in a series of thematic maps showing different alcohol and tobacco related metrics by county and displaying the appropriate retailers as points.

¹ America's Health Rankings United Health Foundation. (2019). Annual Report - Vermont in 2018. Retrieved May 1, 2019, from <https://www.americashealthrankings.org/explore/annual/measure/Overall/state/VT>
² Vermont Department of Health. (2017). Midway to 2020 Report Card (Healthy Vermonters 2020, pp. 1-10, Rep.).
³ Vermont Department of Health. (2019, April 26). Vermont Youth Risk Behavior Survey (YRBS). Retrieved May 1, 2019, from <http://www.healthvermont.gov/health-statistics-vital-records/population-health-surveys-data/youth-risk-behavior-survey-yrbs>
⁴ Campbell, C., Hahn, R., Elder, R., Brewer, R., Chattopadhyay, S., Fielding, J., ... Task Force on Community Preventive Services. (2009). Recommendations for Reducing Excessive Alcohol Consumption and Alcohol-Related Harms by Limiting Alcohol Outlet Density. *American Journal of Preventive Medicine*, 37(6), 570-571. doi:10.1016/j.amepre.2009.09.021
⁵ Cantrell, J., Pearson, J. L., Anesetti-Rothermel, A., Xiao, H., Kirchner, T. R., & Vallone, D. (2015). Tobacco Retail Outlet Density and Young Adult Tobacco Initiation. *Nicotine & Tobacco Research*, 18(2), 130-137. doi:10.1093/ntr/ntv036
⁶ Henriksen, L., Feighery, E. C., Schleiher, N. C., Cowling, D. W., Kline, R. S., & Fortmann, S. P. (2008). Is adolescent smoking related to the density and proximity of tobacco outlets and retail cigarette advertising near schools? *Preventive Medicine*, 47(2), 210-214. doi:10.1016/j.ypmed.2008.04.008



Vermont Retailers per 1,000 Population 2017



Store Type	Total Stores	Alcohol Retailers	Tobacco Retailers
Bar or Restaurant	28	19	3
Beer, Wine, or Liquor Store	56	51	40
Convenience Store	556	514	511
Drug Store or Pharmacy	70	61	53
E-Cigarette/Vape Shop	14	0	11
Grocery Store	155	148	109
Hookah Lounge	1	0	1
Mass Merchandiser	49	37	46
Other Store, Not Listed	120	78	23
Tobacco Shop	6	0	6
Blank	30	1	0
Total	1085	909	803

Results

Based on VDH supplied information, there were 1085 active tobacco and alcohol retailers operating in VT in late 2017 to early 2018. The bulk of these retailers was made up of convenience stores or grocery stores with a roughly similar proportion of alcohol and tobacco retailers for many of the larger categories. There are several areas of high retailer density present in VT. The largest is in Burlington, Chittenden county, the county with by far the highest population. Other high-density areas include Montpelier (the state capital) in Washington county and central Rutland, Orleans, and Caledonia counties. However, when examining retailers by population, Orleans has by far the highest concentration with about 2.3 per every 1,000 people and Chittenden one of the lowest (1.19 per 1,000). Overall, VT has a very wide dispersal of retailers with counties having much of its land area within two or five miles of a retailer, excluding Essex county. May of the more central counties had a ratio of retailers with outside advertising that was higher than other counties apart from Rutland, which was previously shown to have a high density overall.

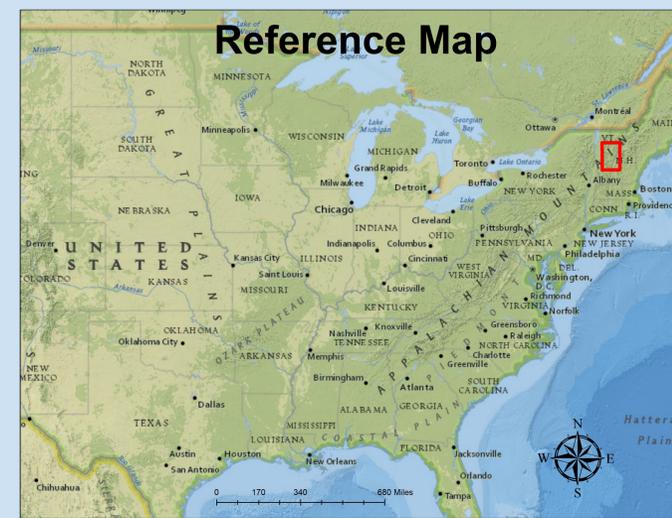
YRBS measures for current alcohol and tobacco use was also applied to the counties of VT. Metrics taken from the 2017 county YRBS reports included high school drinking rates, binge drinking rates, tobacco use rates (cigarettes, cigars, smokeless tobacco, and E-Cigarettes), E-Cigarette use rates, and the difference in LGBT smoking to heterosexual use. High school drinking and binge drinking appear to be somewhat correlated as many counties that have high rates of one, also have high rates of the other. To a lesser extent, the same is true for tobacco use and E-cigarette use. In all four of these measures, the northernmost counties rate as some of the highest with Orleans county constantly being at the top of every use metric. LGBT smoking rates are consistently higher than heterosexual rates across all counties whereas other metrics measured by the YRBS were more mixed. The LGBT populations of Grand Isle and Essex were too small to supply these metrics. VT's most populous county Chittenden had low high school use rates even though they had by far the largest number of retailers. An investigation should be conducted on the county of Orleans since it consistently rated the highest for teen use rates and had the highest number of retailers per population.

Discussion

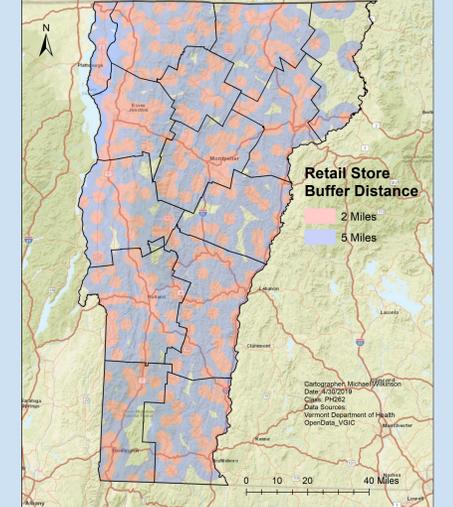
These findings suggest that measures other than general alcohol and tobacco retailer density might affect high school substance use rates. When evaluating initial hypotheses established in the literature associating retailer density with higher use, many of the counties such as Chittenden, Washington, or Rutland were expected to have worst YRBS outcomes. This turned out to not necessarily be true as northern, less populated counties and Bennington tended to have worse alcohol and tobacco use outcomes, despite having a less pronounced density. Number of retailers per 1,000 population was shown to be a far better predictor of these rates than general density. Densities for alcohol and tobacco retailers were similar since VT tobacco licenses are issued free of charge and without pre-approval requirements upon reception of a second-class alcohol license.

There were several limitations encountered throughout this study. As is reflected by the table of retailers, there were not only a number of retailers without a type associated, but also questions arising from classifications and whether that retailer sold alcohol or tobacco. For example, only 91% of beer, wine, or liquor stores sold alcohol and 79% of e-cigarette/vape shops sold tobacco. This casts suspicion on the quality of other metrics included. Additionally, maps were limited by the availability of VT YRBS data. A more granular view of these measures would have been interesting and allowed suggestions to be more targeted. A final limitation was the researcher's inexperience with ArcGIS, which limited the scope of the analyses that could be conducted. This research also had several strengths. All data that was not provided by the VDH was taken directly from other published government sources such as the CDC and VCGI. Additionally, the consistency and clarity of the maps were a strength, as all examine the same location without displaying too much information.

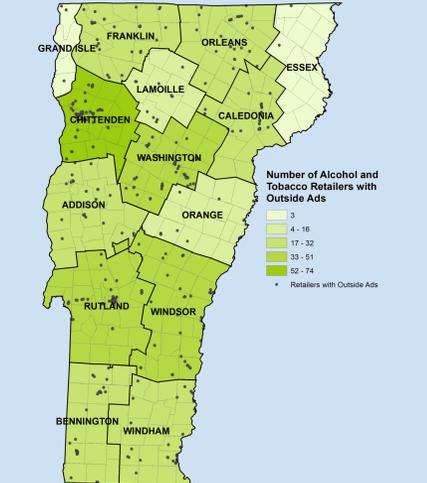
Future VDH research should consider lower population areas when striving to meet Health Vermonters 2020 end goals. The percent of students grade 9-12 who engaged in binge drinking in the past 30 days, smoke cigarettes, and use e-cigarettes are all targeted by this initiative. The 15% goal for binge drinking, 10% goal of smoking, and 12% goal of e-cigarette use are mostly exceeded by the northernmost counties in the state. It can be tempting for initiatives such as this to commit most of its resources to high population areas where the largest number of people can be influenced, but this approach can be exclusionary and often negatively impacts the health of rural areas for the sake of urban areas. I recommend that an investigation into the experiences of the high school students of Orleans county (the worst performing in almost all evaluated YRBS measures) be conducted. This will not only help VT meet Healthy Vermonters 2020 goals but also help to decrease the 33.8% difference in health disparity, a measure which is the 47th worst in the county.



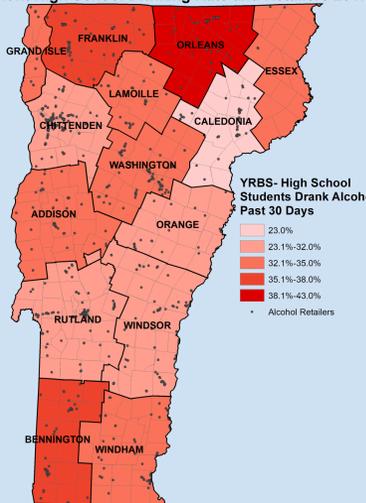
Exposure to Alcohol and Tobacco Retailers in Vermont Communities 2018



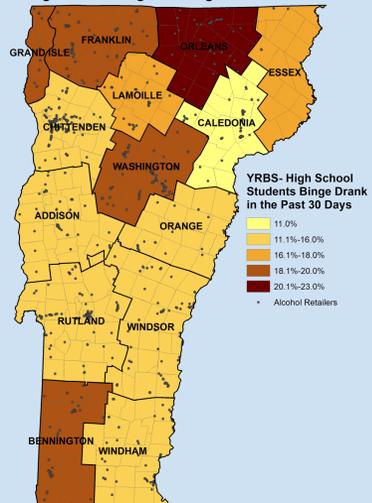
Vermont Retailers with Outside Advertisements 2017



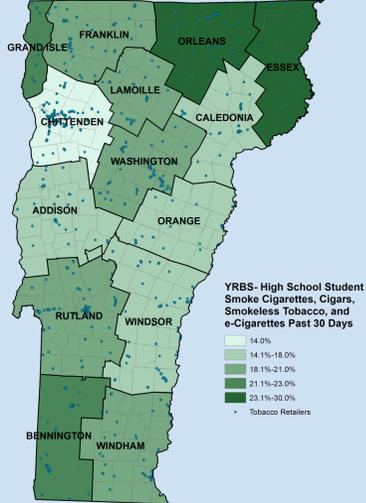
Vermont High School Drinking Rate and Retailers 2017



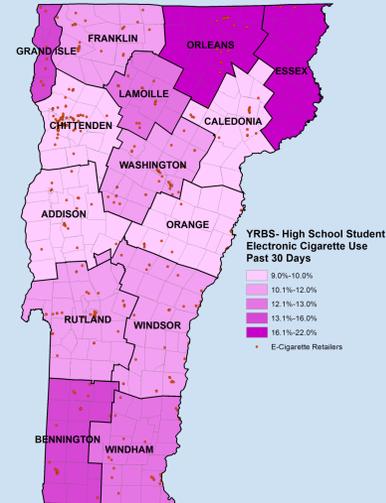
Vermont High School Binge Drinking Rate and Retailers 2017



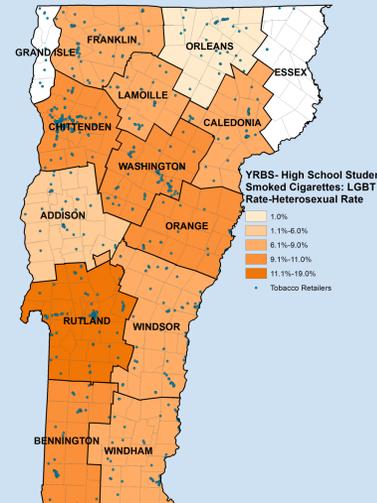
Vermont High School Tobacco Use Rate and Retailers 2017



Vermont High School E-Cigarette Use Rates and Retailers 2017



Vermont LGBT vs Heterosexual Smoking Rates and Retailers 2017



Cartographer: Michael Wilkinson
Date: 5/3/2019 | Spring Semester 2019
Class: PH262, GIS for Public Health, Professor Tom Stopka
Data Sources:
 Vermont Department of Health
 Vermont YRBS
 OpenData_VGIC
Coordinate System: GCS_North_America_1983
Projected Coordinate System:
 NAD_1983_StatePlane_Vermont_FIPS_4400