Tobacco Quitting Attempts

Allison Louie

Introduction

The dataset under investigation, sourced from the CDC National Center for Health Statistics, presents a comprehensive collection of surveys that have been conducted nationwide. This looks into the surveys taken from all over the country to smoking, e-smoking or smokeless tobacco use; prevalence of use through demographics; as well as quitting attempts. These surveys span across the United States, encompassing regions nationwide as well as territories like Guam, offering a look into smoking habits and behaviors.

The primary focus of this research is to figure out is there a difference in the cessation attempts among the groups (cigarette vs e-cigarettes vs smokeless tobacco)? The research tries to find an understanding in the efficacy and success rates of cessation attempts within these groups. Another focus is looking into cigarette users: are they able to successfully quit?

Methods

The dataset used in this research was sourced from the Behavioral Risk Factor Surveillance System (BRFSS), spanning from 2011 to 2019. These surveys encompass diverse states across the United States, including Guam, and collected information pertaining to smoking habits, cessation attempts, and various measures related to tobacco use.

Data cleaning and organization procedures were conducted utilizing RStudio. The dataset was refined to focus specifically on essential variables including the year, location, tobacco use topics, measurement descriptors, responses, and data values represented as percentages.

To ensure data quality, observations with missing values or responses irrelevant to the study focus (e.g., "Currently" or "Not Currently") in the Response variable were excluded. Approximately 67% of the observations were omitted due to these criteria, aiming for a focused analysis of smoking status and cessation attempts. It may have had an impact on how the results were presented.

To look more into the quitting attempts, we observed more of the responses to surveys that dealt with cessation among cigarette smokers who smoke daily. The data only provided these topics of cessation exclusively with cigarette smokers, which makes sense since the information on cigarette smoking is extensive. This would be used to examine into more detail about how these users tried to quit and the percentage of those who became former users.

The accuracy and consistency of average data values related to quitting attempts and former smokers over the years were validated. Notably, Puerto Rico served as an illustrative example due to its notably high average values in quitting attempts and former smokers over the observed years. We arranged the survey data of Puerto Rico (2011 or 2016 for example) by sample size since there are values that add up to 100%. The only ones that were observed were smokeless tobacco users and smoking status since they are the only measures that managed to add up to 100%.

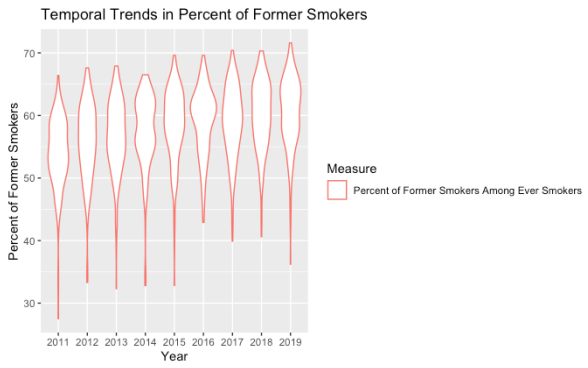
We used maps to pinpoint the surveys' data value percentage of former users in the different smoking groups and cigarette users quitting attempts to see if there was a difference demographically. Histograms were also used to compare the distribution of the data values of former smokers from the surveys to see if people were successful in quitting. They also were used to look at the difference in responses of usage in the different smoking groups: cigarette and e-cigarettes and smokeless tobacco use. Scatter plots were used to compare the data values in a

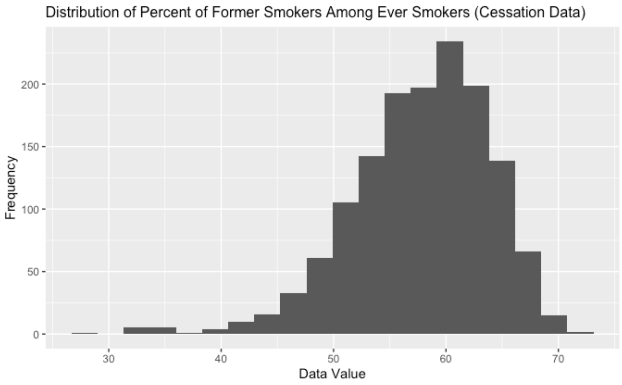
state using the sample sizes of each survey observed. This would look at how the average data value of those who were former smokers or attempted to quit would change over the years. Possible confounds (gender, race, age, and education) were analyzed to see if it has an influence on smoking and quitting attempts. Most of the information when looking for confounders were found not to be there since cleaning the data might have impacted the results. It also should be noted that those that had impact from the possible confounds (gender, race, age, and education) were more specifically used in surveys that looked into the current smoking status of adults by ethnicity—which was not relevant to the research. Violin plots and boxplots were used to observe if there had been any impact on the relationship between smoking groups and quitting attempts.

Preliminary Results

Quitting Attempts in Cigarette Smokers

For the former smokers survey in the cessation data, it appears that the percentage of former smokers have been increasing over the years. It also appears skewed left—showing that according to the surveys, people have been able to quit in smoking habits.





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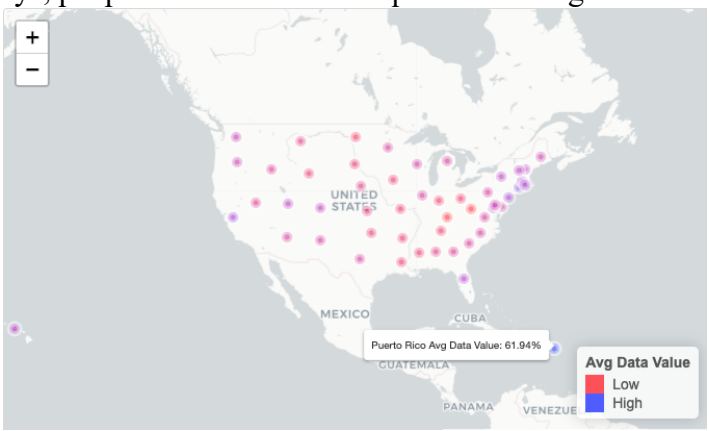
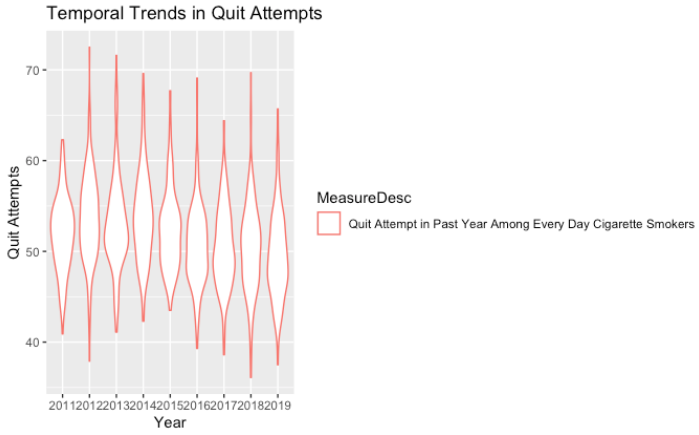


It seems that overall, those who have considered themselves former smokers cigarette smokers in the surveys throughout the years have been low except for Puerto Rico, which has an average value of 61.94%. Same as the former smokers, those who have been attempting to quit are overall low except in Puerto Rico (has the same percentage). It is hard to say if quitting attempts

and former smokers are related to one another since there needs to be more observation with over the years and compiling together the survey responses.
Over the years, it seems that in the surveys, the data value of cigarette smokers who attempted to quit have been relatively by chance (50%). 2014 had the highest mean data value in its surveys, which means that there is some interesting values from the surveys that made it the highest among the other years. 2018 had the highest range in surveys in terms of the quitting attempts (36.1-69.7), so the mean value of the data value is a bit low. 2019 has the lowest mean in terms of the surveys dealing with quitting attempts, so the surveys may indicate that by recent years, people are reporting not as inclined to attempt in quitting.

Year	Mean	Data Value Range
2011	51.93396	40.9 - 62.3
2012	53.66415	37.9 - 72.5
2013	53.01824	41.1 - 71.6
2014	53.79182	42.3 - 69.6
2015	52.40377	43.5 - 67.7
2017	50.49937	38.6 - 64.4
2018	50.36164	36.1 - 69.7
2019	49.54231	37.5 - 65.7



Distribution of Data Values in State

In terms of wanting to see if the values are accurate, we looked to see how the percentage of former users compared to the other users (used 2011 but the data value adding to 100% is the same for the other years) for Puerto Rico. Puerto Rico was chosen since it was the highest average data value in terms of quitting attempts and former users. In comparison, we see that those who were former in terms of smoking status compared to those who had responded in "current" or "never" is not that big but still a lot more than those who considered themselves as current users. There are a good amount of people who are able to quit successfully.

Response	Sample_Size	Data_Value
Former	2137	22.5
Current	2137	13.6
Never	2137	63.9

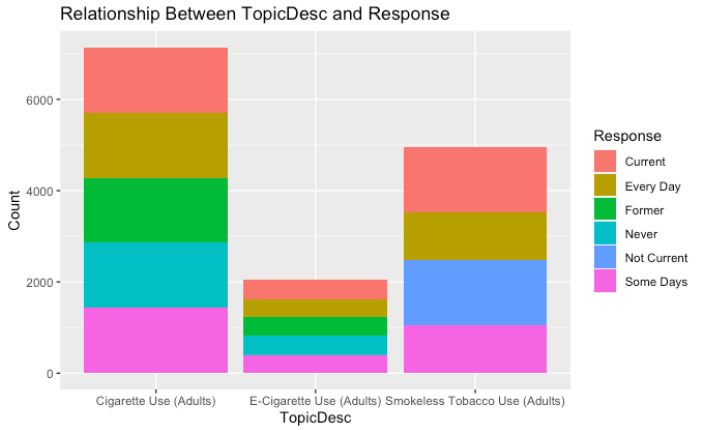
We also looked at smokeless tobacco use and user status. To make sure that the data value (in percentage) is accurate, we looked at the distribution amongst the total that were observed in a sample of the sample of 2011 (the distribution all over the years also checked out to 100%). Although we cannot say for sure that "not current" equates to "former," it is still useful that a larger majority are not using smokeless tobacco as much. So there is little concern over the users of smokeless tobacco to quit since the percentage of those who do currently smoke is small.

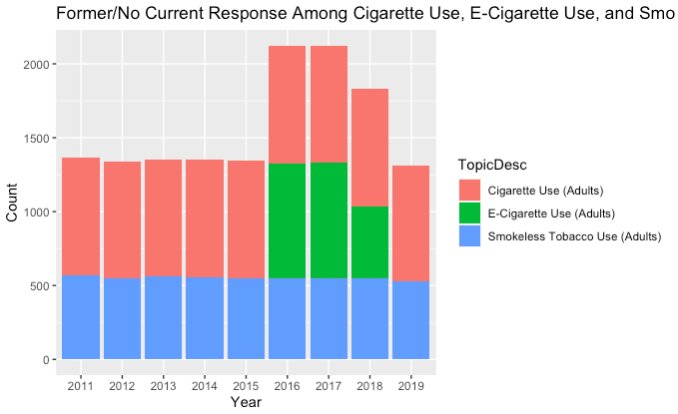
Response	Data_Value
Current	1.6
Not Current	98.4

Topics of Surveys

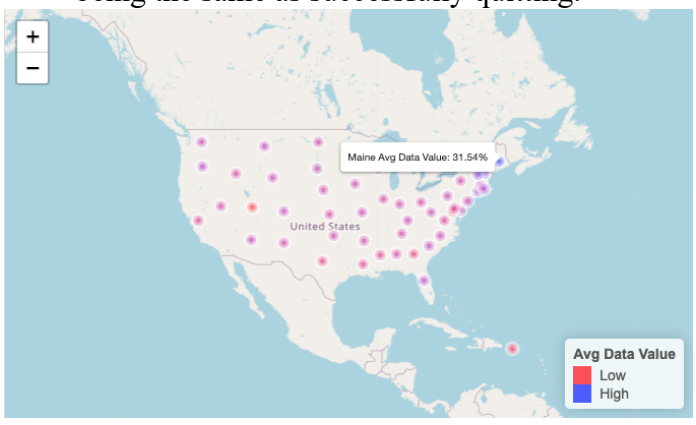
Between the different categories of cigarette usage, it appears that for more surveys on quitting attempts focused on cigarette and e-cigarette use. However, people do not seem to quit with smokeless tobacco use. Not only that, but the responses for not current only appears for smokeless tobacco use in adults. It makes it interesting to see whether or not "not current" could lead to "former" or it could be taking a break for a while.

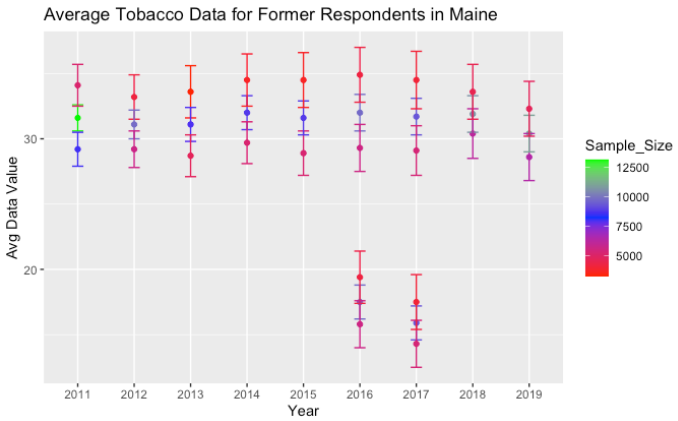
	Current	Every Day	Former	Never	Not Current	Some Days
Cigarette Use (Adults)	1428	1428	1428	1428	0	1428
E-Cigarette Use (Adults)	417	397	417	417	0	397
Smokeless Tobacco Use (Adults)	1428	1048	0	0	1428	1048





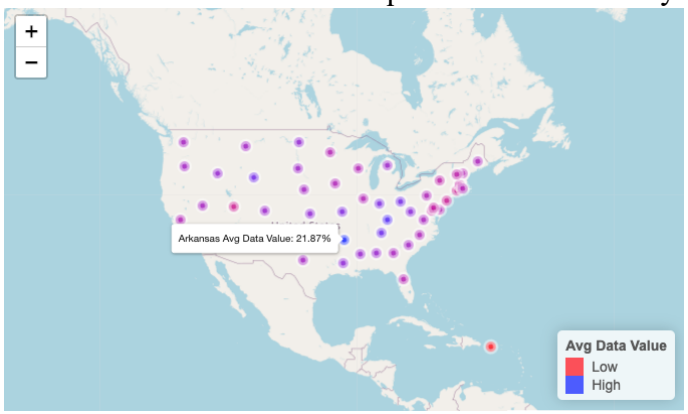
Over the years, it seems that cigarette use has been the larger topic of research in the 8 years of survey collection compared to the rest of them. Smokeless tobacco use does not change in terms of the number of former users, seeming stagnant. Also, quitting e-cigarette use seems to be a more recent and does not seem to be as prevalent as cigarette use and smokeless tobacco use. Former was defined in these surveys as whether or not they use these, which can be assumed as being the same as successfully quitting.

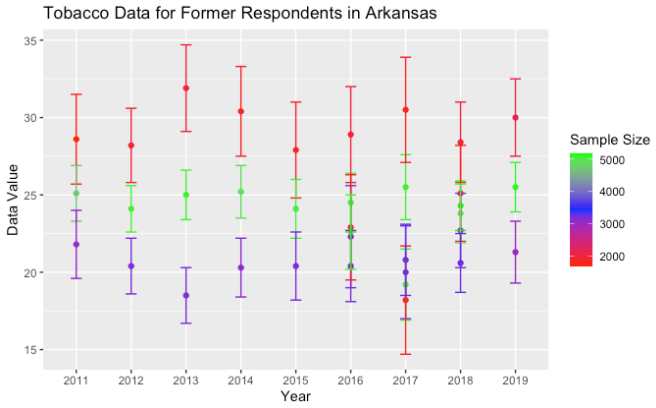




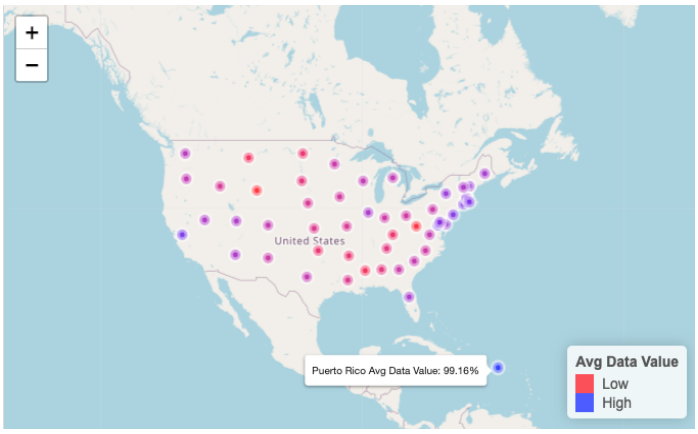
Overall, the trend throughout cigarette use seems to be low except for the high east, where there seems to be more higher average data values. Despite the percentages being quite low for those who considered themselves former smokers in the surveys, Maine has the highest percentage (31.54%) on average. 2016 for Maine also seemed to have the highest data value range of those

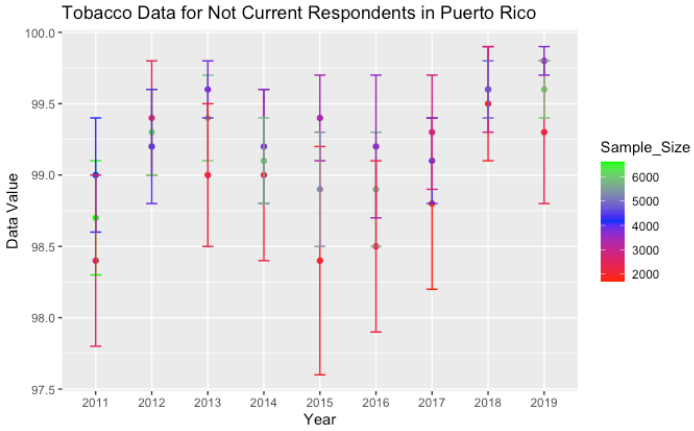
who became former users in tobacco use. On the other hand, 2017 had the lowest percentage of those who were able to quit as well. Over the years, it does seem that the values are going down.





Looking at e-cigarette users, we see that overall that the average data values of former smokers for the surveys are on the higher side throughout the country. The average percentages are much lower (4.42-21.87%) compared to the surveys of former cigarette users (16-31%). Still, it is interesting to see that overall the transition from smoking is notable. On the other hand, Arkansas has the highest percentage on average for e-cigarette users (21.87%) who managed to be former users. We see the distribution of values are attributed





For smokeless tobacco users, it is relatively low overall throughout the country. However, the percentages are much higher compared to the other groups (90% range). This suggests that in the surveys, people who are smokeless tobacco users are easily able to not use tobacco compared to the other two groups. It should be noted that this is "not currently" and not “former”. There is inconclusive evidence that it equates to "former use". Puerto Rico has the highest percentage of users (99.16%) who are not currently using them. For the range of the years, it seems that for Puerto Rico, there has been an increase in the percentage of those who are not currently using for smokeless tobacco users recently (since 2019 has the highest percentage of 99.8%). It has been relatively stagnant over the years overall, but perhaps it is easier to not use as much as the other two groups.

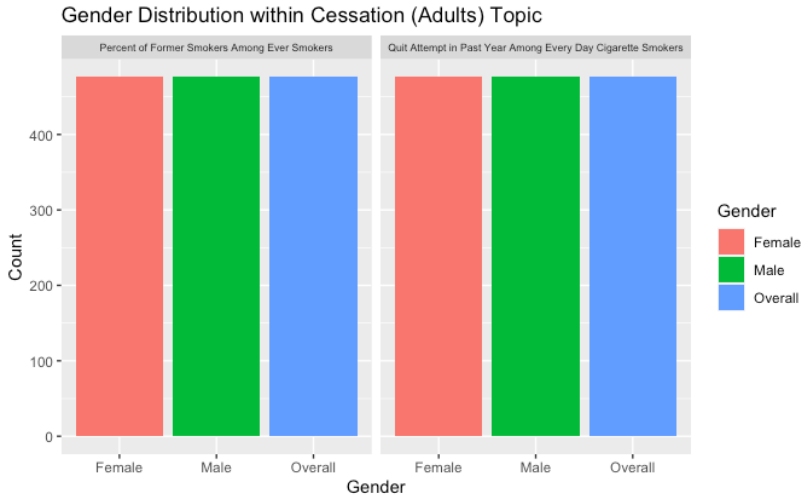
Possible Confounders

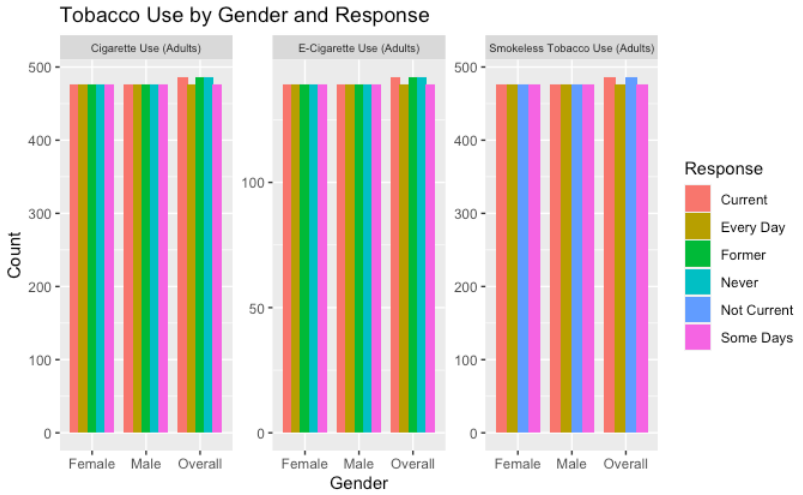
Gender

Quitting attempt surveys only had gender as a possible concern in the data. While looking at the comparison of gender within the surveys, it seems that they are relatively even between male and female, so gender does not impact or threaten the relationship between cigarette smokers and

quitting attempts. There are more data that investigate surveys that have both rather than separate.

Var1	Var2	Var3	Freq
Cessation (Adults)	Female	Percent of Former Smokers Among Ever Smokers	476
Cessation (Adults)	Male	Percent of Former Smokers Among Ever Smokers	476
Cessation (Adults)	Overall	Percent of Former Smokers Among Ever Smokers	476
Cessation (Adults)	Female	Quit Attempt in Past Year Among Every Day Cigarette Smokers	476
Cessation (Adults)	Male	Quit Attempt in Past Year Among Every Day Cigarette Smokers	476
Cessation (Adults)	Overall	Quit Attempt in Past Year Among Every Day Cigarette Smokers	476

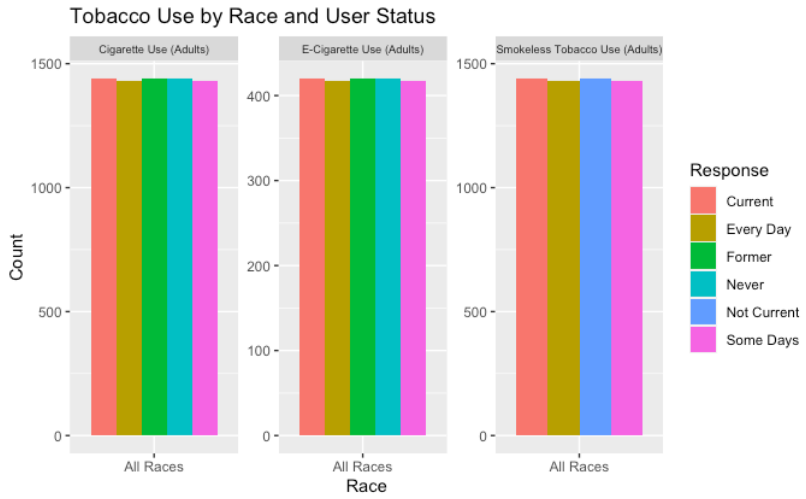




Race

In terms of race, it does not seem to pose as a problem of a confounder since these topics only looked at all races rather than specific ethnicity (which was reserved for only current users). Race does not impact the relationship for tobacco use and quitting success.

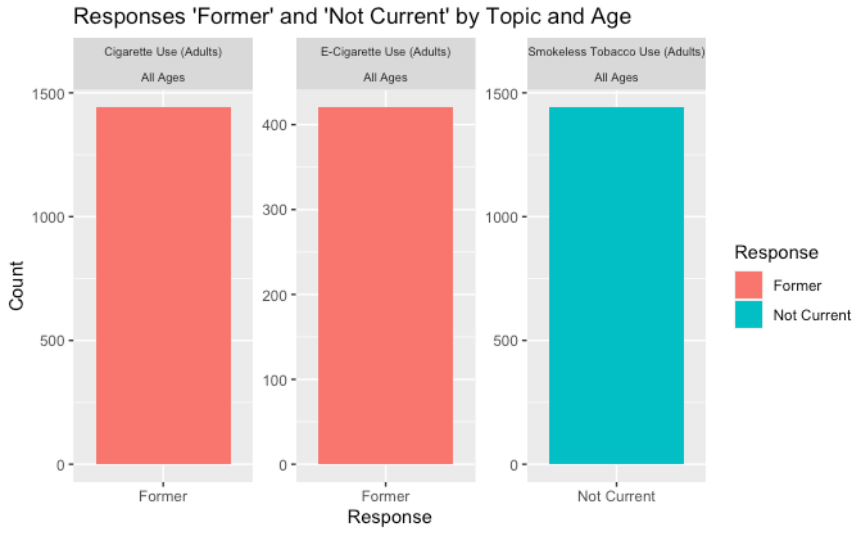
TopicDesc	Race	Response	Count
Cigarette Use (Adults)	All Races	Former	1440
E-Cigarette Use (Adults)	All Races	Former	420
Smokeless Tobacco Use (Adults)	All Races	Not Current	1440



Age

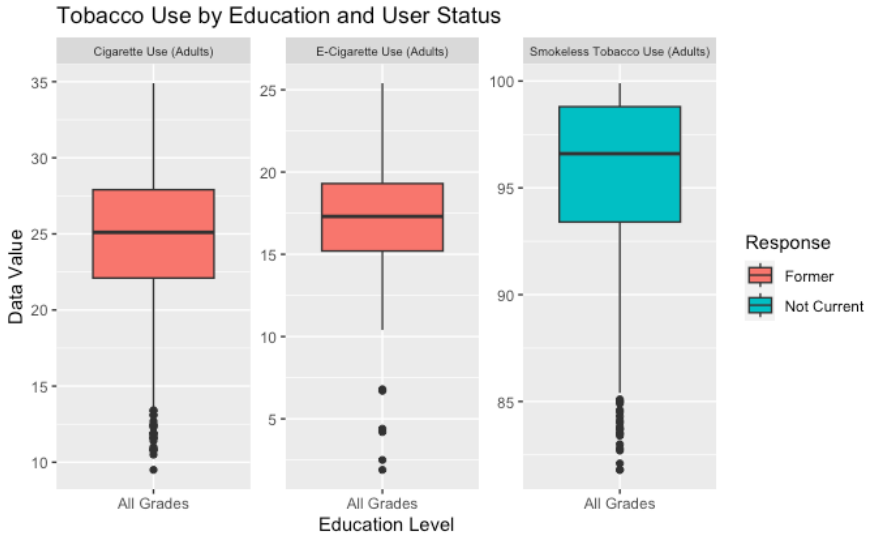
Age was also observed to see how it impacted the relationship of tobacco groups and their smoking status. Overall, it appears that there is no concern at all with impact with age since the data only used all ages with concern to cessation. It also has to do with the cleaning up with the data, which may have impacted the results.

Var1	Var2	Var3	Freq
Cigarette Use (Adults)	Former	All Ages	1440
E-Cigarette Use (Adults)	Former	All Ages	420
Smokeless Tobacco Use (Adults)	Former	All Ages	0
Cigarette Use (Adults)	Not Current	All Ages	0
E-Cigarette Use (Adults)	Not Current	All Ages	0
Smokeless Tobacco Use (Adults)	Not Current	All Ages	1440



Education

In education levels, there is no distribution of any difference between education. And for these specific surveys looking at these different tobacco use, they only looked at all grades (the varying education levels were used for those who were in current and therefore not included in this research). Therefore, education is not a concerning confounder in trying to understand the relationship between tobacco use and quitting attempt.



Conclusion

In general, it appears that cigarette use has been increasingly had more people quit as compared to the other groups. It has to do with the extensive amount of research done more with cigarette use compared to the others and therefore have higher results. It also seems that the cigarette users are overall not really successful in quitting since it is within the 49-51% range. As of 2019, it seems that not many surveys found cigarette users to be willing to attempt to quit. We can trust the data values since they all combine to 100%.

However, there are still missing pieces of information that need to be explored—like how the surveys defined not currently for the smokeless tobacco users. It is still unsure if it means they have completely quit or if they have stopped at the moment. Or if there are other benefits that smokeless tobacco use has that makes it easier to not need to quit as much as the other groups. Since there are numerous topics and measures for the surveys, it is hard to completely determine if there is much success in quitting for smokeless tobacco users. Not only that, it is a bit hard to determine whether or not they have successfully quit. It would also be useful if there were any information that looked at the long-term implications of the smoking usage on cessation. This could provide a lot more insights on to how it was beneficial as well as being able to determine on a more individual level how many years they had been former users of tobacco.

There does seem to be a demographic relation in terms of who manages to quit or attempt stopping in smoking with the different groups. There should also take into account that many of the surveys had different numbers in their sample size, so the data might have been somewhat skewed in terms of this. However, in terms of confounders like age, gender, or education, it does not seem to pose a threat to the data since the surveys ensure that they have overall all groups. The ones that had these confounds had to do with current use rather than those who had quit, so that is why it may have no impact on the relationship. But there should be more surveys that observe any possible difference and note it.