lab10: Halloween Mini Project

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Contents

Importing the 538 Candy Popularity Dataset

```
candy_file <- "candy-data.csv"

candy = read.csv(candy_file, row.names = 1)

#head(candy)
```

Q1. How many different candy types are in this dataset?

There are 85 different types of candy.

```
nrow(candy)
```

```
## [1] 85
```

Q2. How many fruity candy types are in the dataset?

There are 38 fruity candy types in the dataset.

```
sum(candy$fruity)
```

```
## [1] 38
```

What is your favorite candy?

Q3. What is your favorite candy in the dataset and what is it's winpercent value?

My favorite candy in the dataset is M&M's. The win percent for M&M's is 66.6%.

```
candy["M&M's", ]$winpercent
```

```
## [1] 66.57458
```

Q4. What is the winpercent value for "Kit Kat"?

The winpercent value for Kit Kat is 76.8%.

```
candy["Kit Kat", ]$winpercent
```

```
## [1] 76.7686
```

Q5. What is the winpercent value for "Tootsie Roll Snack Bars"?

The winpercent value for Tootsie Roll Snack Bars is 49.7.

```
candy["Tootsie Roll Snack Bars", ]$winpercent
```

```
## [1] 49.6535
```

`skim(candy)` could not be included because of a unicode support error with installation of TinyTex/Latex

```
library("skimr")
#skim(candy)
```

Q6. Is there any variable/column that looks to be on a different scale to the majority of the other columns in the dataset?

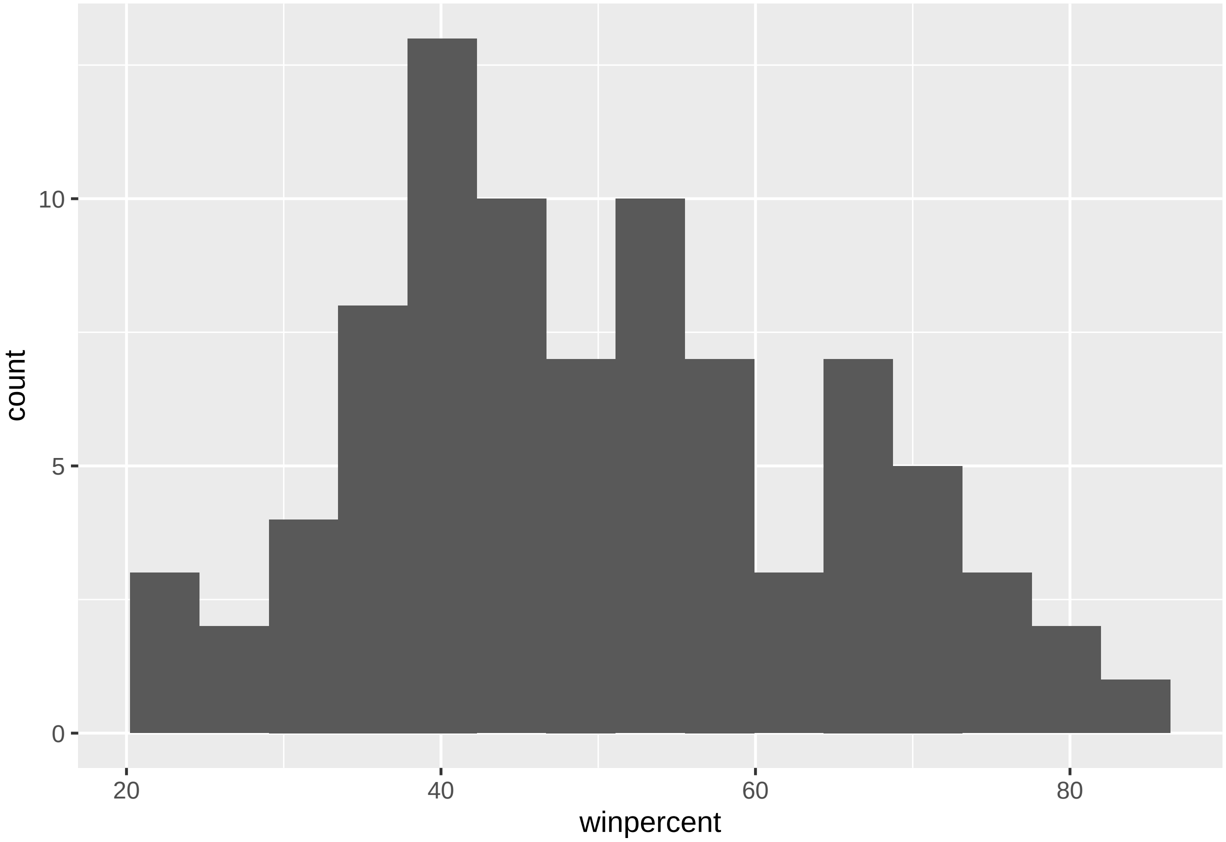
The winpercent column seems to be on a different scale than the other columns in the dataset.

Q7. What do you think a zero and one represent for the candy$chocolate column?

I think zero and one represent whether a candy has chocolate or not.

Q8. Plot a histogram of winpercent values

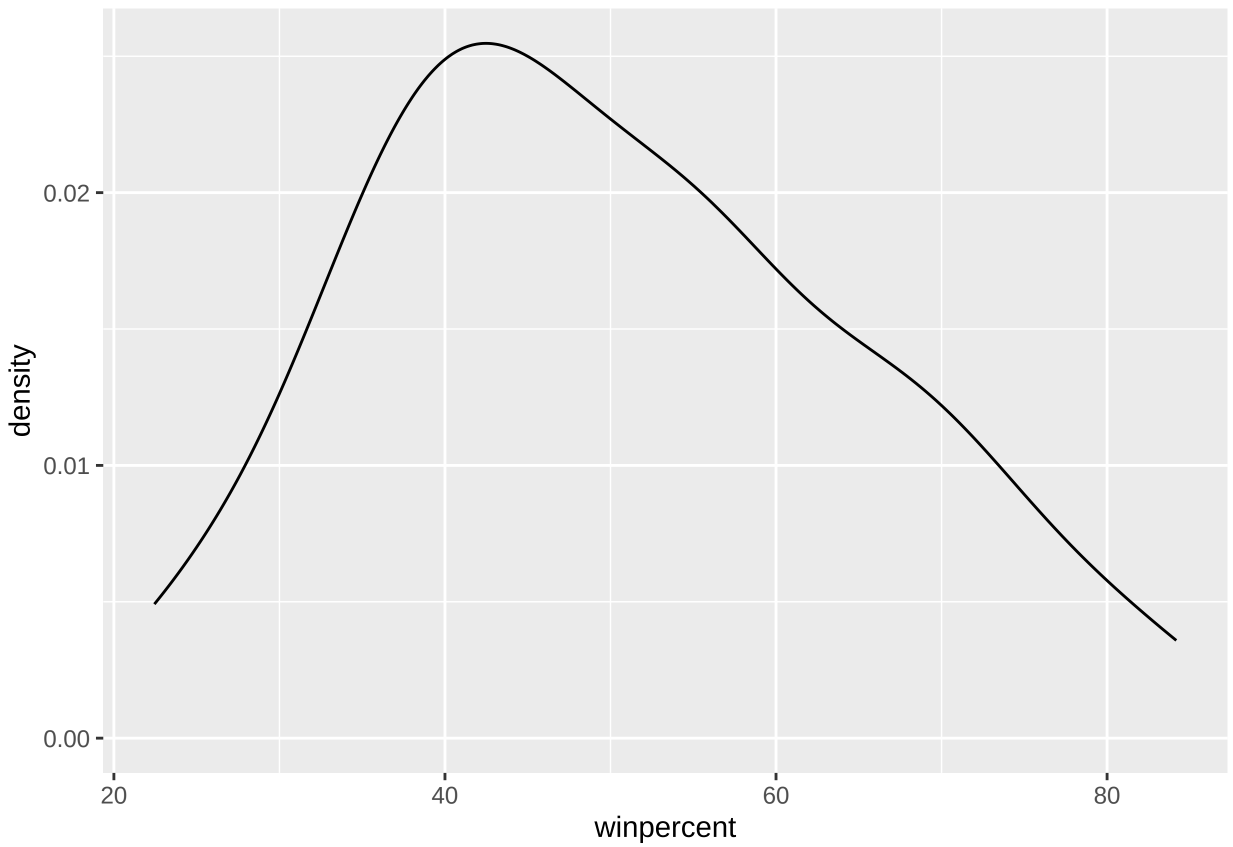
```
library(ggplot2)

ggplot(candy) + aes(winpercent) + geom_histogram(bins = 15)
```



Q9. Is the distribution of winpercent values symmetrical?

The distribution of winpercent values is not symmetrical.

```
ggplot(candy) + aes(winpercent) + geom_density()
```



Q10. Is the center of the distribution above or below 50%?

The center of the distribution appears to be below 50%.

```
summary(candy$winpercent)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##   22.45   39.14   47.83   50.32   59.86   84.18
```

Q11. On average is chocolate candy higher or lower ranked than fruit candy?

On average chocolate candy is higher ranked than fruity candy.

```
chocWinPercent <- candy$winpercent[as.logical(candy$chocolate)]
fruityWinPercent <- candy$winpercent[as.logical(candy$fruity)]

mean_chocWinPerecent <- mean(chocWinPercent)
mean_fruityWinPercent <- mean(fruityWinPercent)

mean_chocWinPerecent > mean_fruityWinPercent
```

```
## [1] TRUE
```

Q12. Is this difference statistically significant?

Using a T-test, the difference is statistically significant.

```r
t.test(chocWinPercent, fruityWinPercent)
```

```
##
##  Welch Two Sample t-test
##
## data:  chocWinPercent and fruityWinPercent
## t = 6.2582, df = 68.882, p-value = 2.871e-08
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  11.44563 22.15795
## sample estimates:
## mean of x mean of y
##  60.92153  44.11974
```

Overall Candy Rankings

Q13. What are the five least liked candy types in this set?

The five least liked candies in this set are Nik L Nip, Boston Baked Beans, Chiclets, Super Bubble, and Jawbusters.

```r
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
candy %>% arrange(winpercent) %>% head(5)
```

```
##                    chocolate fruity caramel peanutyalmondy nougat
## Nik L Nip                  0      1       0              0      0
## Boston Baked Beans         0      0       0              1      0
## Chiclets                   0      1       0              0      0
## Super Bubble               0      1       0              0      0
## Jawbusters                 0      1       0              0      0
##                    crispedricewafer hard bar pluribus sugarpercent pricepercent
## Nik L Nip                         0    0   0        1        0.197        0.976
## Boston Baked Beans                0    0   0        1        0.313        0.511
## Chiclets                          0    0   0        1        0.046        0.325
## Super Bubble                      0    0   0        0        0.162        0.116
## Jawbusters                        0    1   0        1        0.093        0.511
##                    winpercent
## Nik L Nip            22.44534
## Boston Baked Beans   23.41782
## Chiclets             24.52499
## Super Bubble         27.30386
## Jawbusters           28.12744
```

Q14. What are the top 5 all time favorite candy types out of this set?

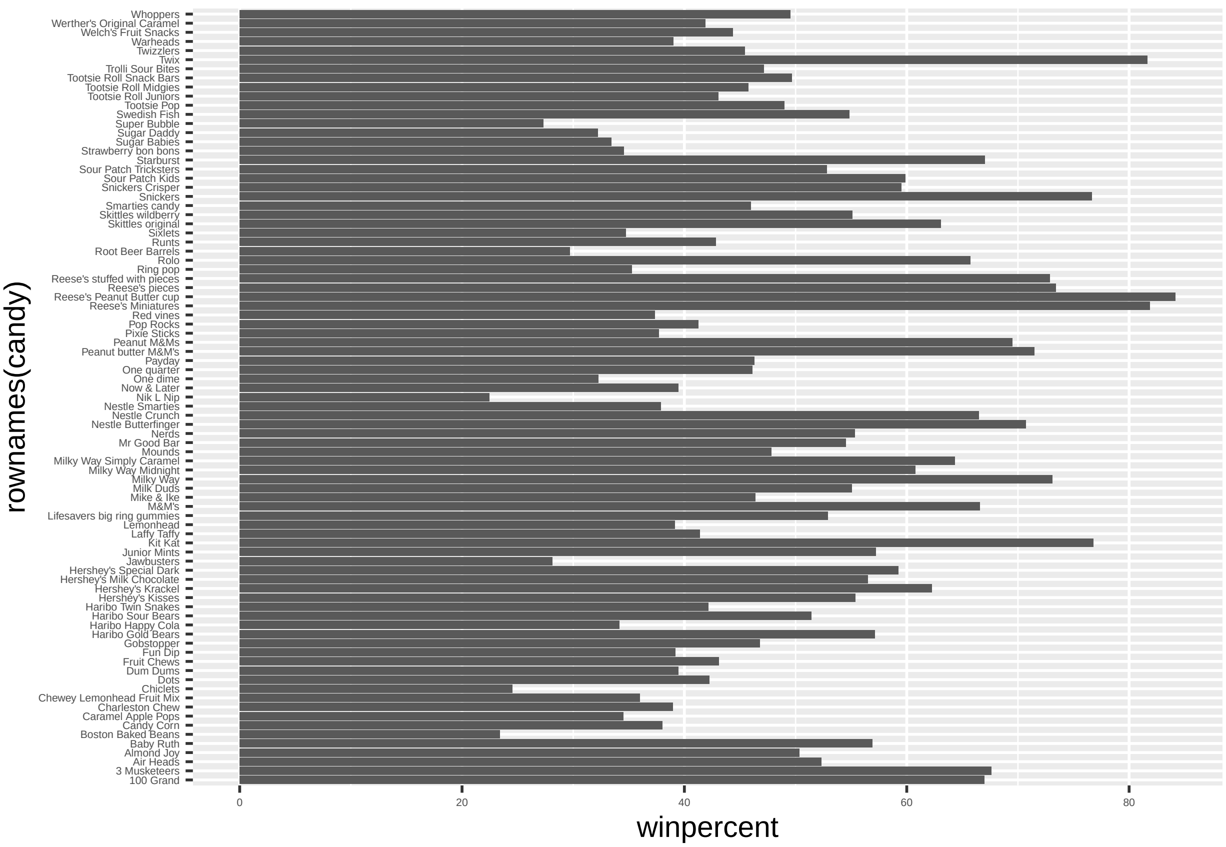
The top 5 most popular candies are in this set are Reese's Peanut Butter Cups, Reese's Miniatures, Twix, Kit Kat, and Snickers.

```
candy %>% arrange(desc(winpercent)) %>% head(5)
```

```
##                           chocolate fruity caramel peanutyalmondy nougat
## Reese's Peanut Butter cup         1      0       0              1      0
## Reese's Miniatures                1      0       0              1      0
## Twix                              1      0       1              0      0
## Kit Kat                           1      0       0              0      0
## Snickers                          1      0       1              1      1
##                           crispedricewafer hard bar pluribus sugarpercent
## Reese's Peanut Butter cup                0    0   0        0        0.720
## Reese's Miniatures                       0    0   0        0        0.034
## Twix                                     1    0   1        0        0.546
## Kit Kat                                  1    0   1        0        0.313
## Snickers                                 0    0   1        0        0.546
##                           pricepercent winpercent
## Reese's Peanut Butter cup        0.651   84.18029
## Reese's Miniatures               0.279   81.86626
## Twix                             0.906   81.64291
## Kit Kat                          0.511   76.76860
## Snickers                         0.651   76.67378
```

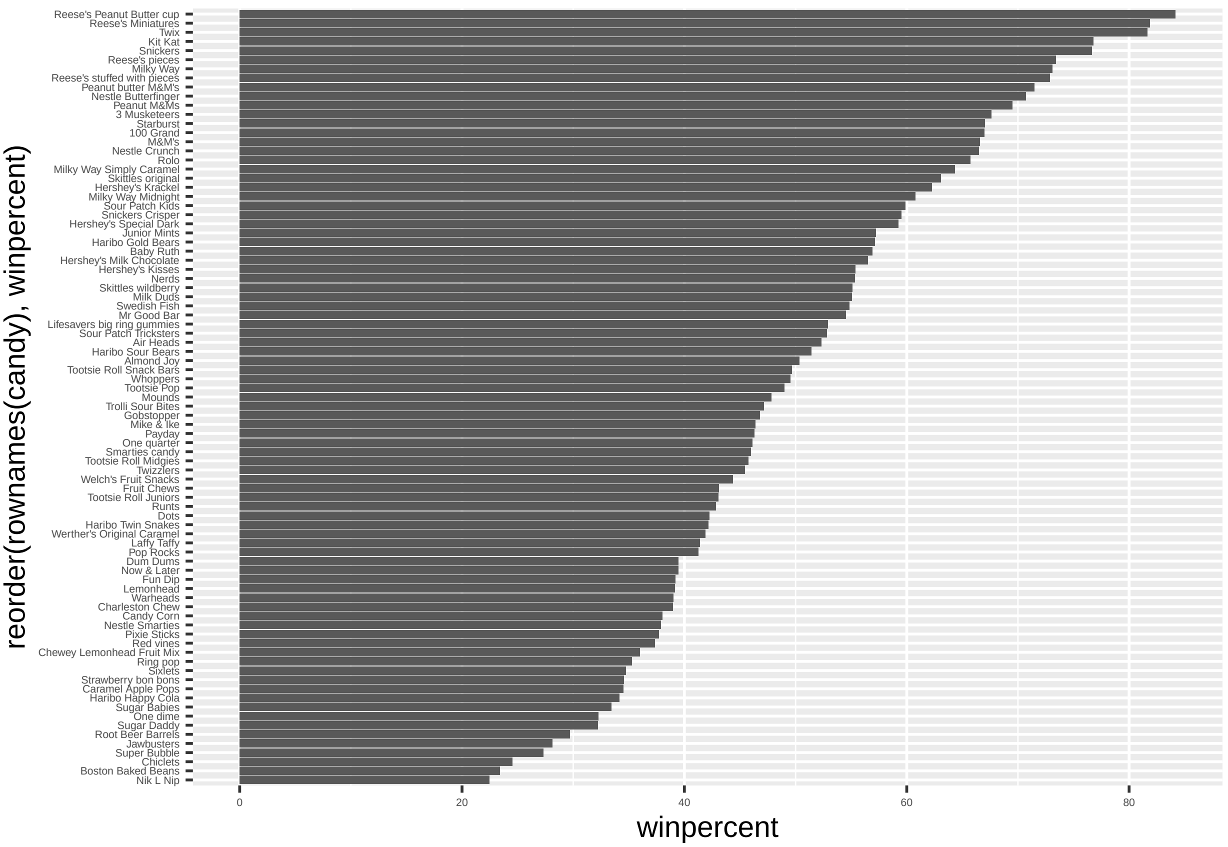
Q15. Make a first barplot of candy ranking based on winpercent values.

```
ggplot(candy) + aes(winpercent, rownames(candy)) + geom_col() + theme(axis.text=element_text(size=4))
```

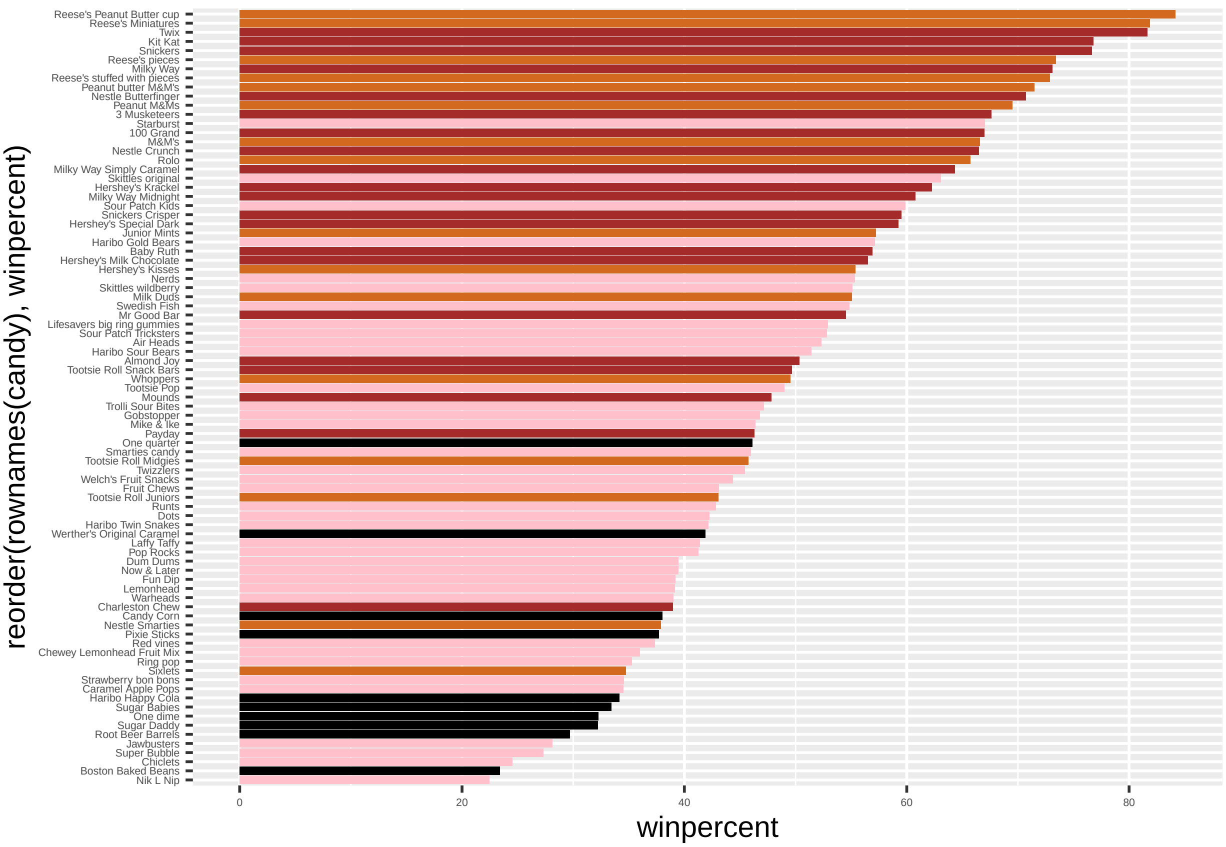


Q16. This is quite ugly, use the reorder() function to get the bars sorted by winpercent?

```
ggplot(candy) + aes(winpercent, reorder(rownames(candy),winpercent)) + geom_col() + theme(axis.text=ele
```



```
my_cols=rep("black", nrow(candy))
my_cols[as.logical(candy$chocolate)] = "chocolate"
my_cols[as.logical(candy$bar)] = "brown"
my_cols[as.logical(candy$fruity)] = "pink"

ggplot(candy) +
  aes(winpercent, reorder(rownames(candy),winpercent)) +
  geom_col(fill=my_cols) + theme(axis.text=element_text(size=4))
```



Q17. What is the worst ranked chocolate candy?

The worst ranked chocolate candy is Sixlets.

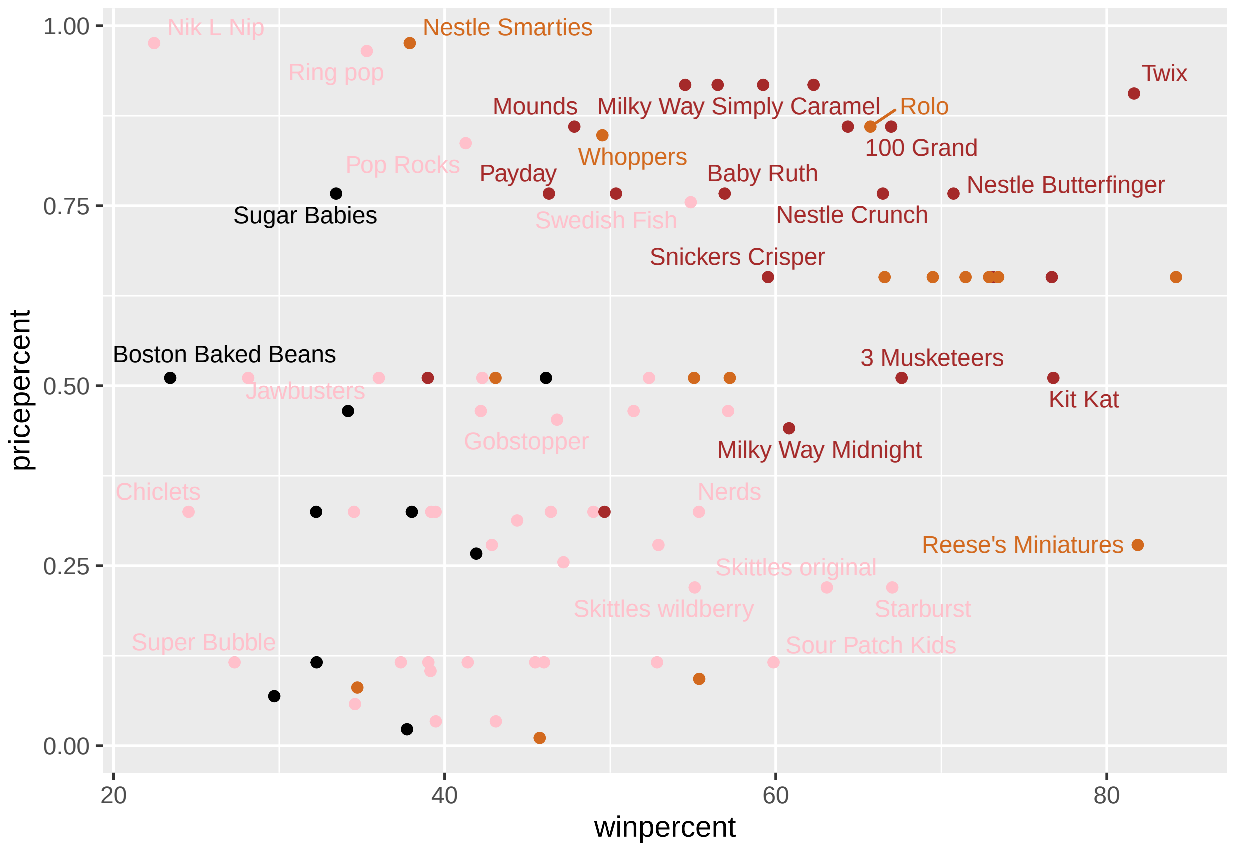
Q18. What is the best ranked fruity candy?

The best ranked fruit candy is Starbursts.

Taking a look at pricepercent

```
library(ggrepel)

# How about a plot of price vs win
ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=my_cols) +
  geom_text_repel(col=my_cols, size=3.3, max.overlaps = 5)
```

```
## Warning: ggrepel: 54 unlabeled data points (too many overlaps). Consider
## increasing max.overlaps
```



Q19. Which candy type is the highest ranked in terms of winpercent for the least money - i.e. offers the most bang for your buck?

The candy type that is highest ranked for the best price is Reese's Miniatures.

Q20. What are the top 5 most expensive candy types in the dataset and of these which is the least popular?

The top 5 most expensive candy types are Nik L Nip, Nestle Smarties, Ring pop, Hershey's Krackel, and Hershey's Milk Chocolate.

The least popular of these candies is Nik L Nip.

```
candy %>% arrange(desc(candy$pricepercent)) %>% head(5)
```

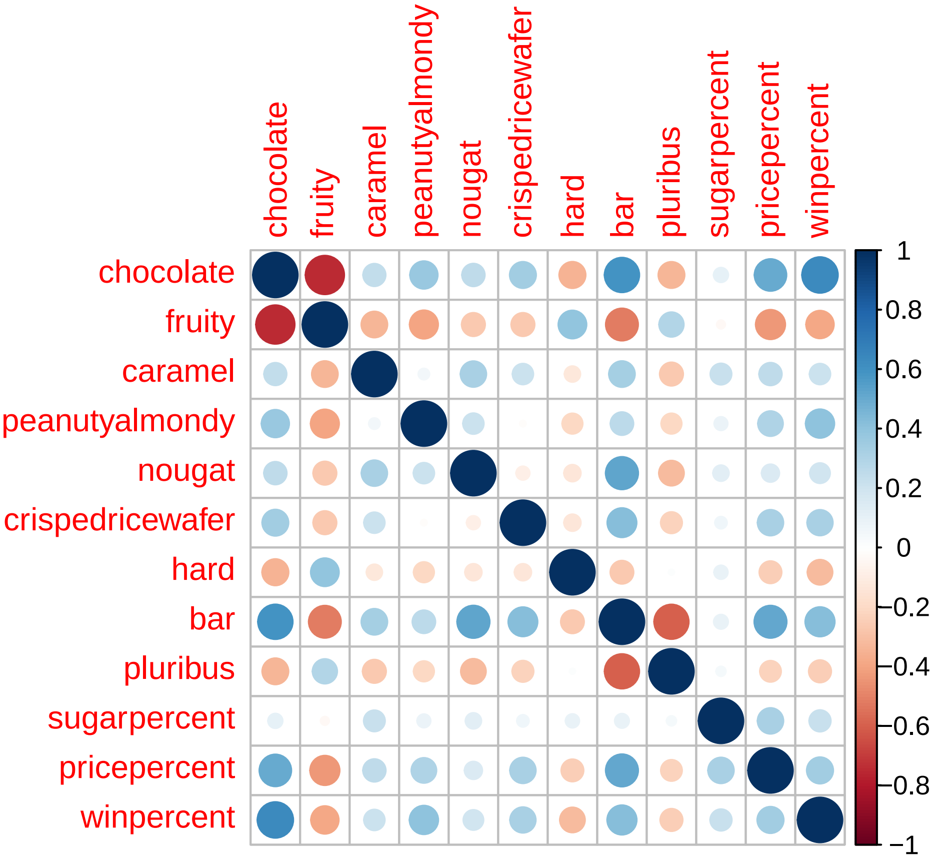
```
##                          chocolate fruity caramel peanutyalmondy nougat
## Nik L Nip                        0      1       0              0      0
## Nestle Smarties                  1      0       0              0      0
## Ring pop                         0      1       0              0      0
## Hershey's Krackel                1      0       0              0      0
## Hershey's Milk Chocolate         1      0       0              0      0
##                          crispedricewafer hard bar pluribus sugarpercent
## Nik L Nip                               0    0   0        1        0.197
## Nestle Smarties                         0    0   0        1        0.267
## Ring pop                                0    1   0        0        0.732
## Hershey's Krackel                       1    0   1        0        0.430
## Hershey's Milk Chocolate                0    0   1        0        0.430
##                          pricepercent winpercent
## Nik L Nip                      0.976   22.44534
## Nestle Smarties                0.976   37.88719
## Ring pop                       0.965   35.29076
## Hershey's Krackel              0.918   62.28448
## Hershey's Milk Chocolate       0.918   56.49050
```

Exploring the correlation structure

```
library(corrplot)
```

```
## corrplot 0.95 loaded
```

```
cij <- cor(candy)
corrplot(cij)
```



Q22. Examining this plot what two variables are anti-correlated (i.e. have minus values)?

The chocolate and fruity variables are anti-correlated.

Q23. Similarly, what two variables are most positively correlated?

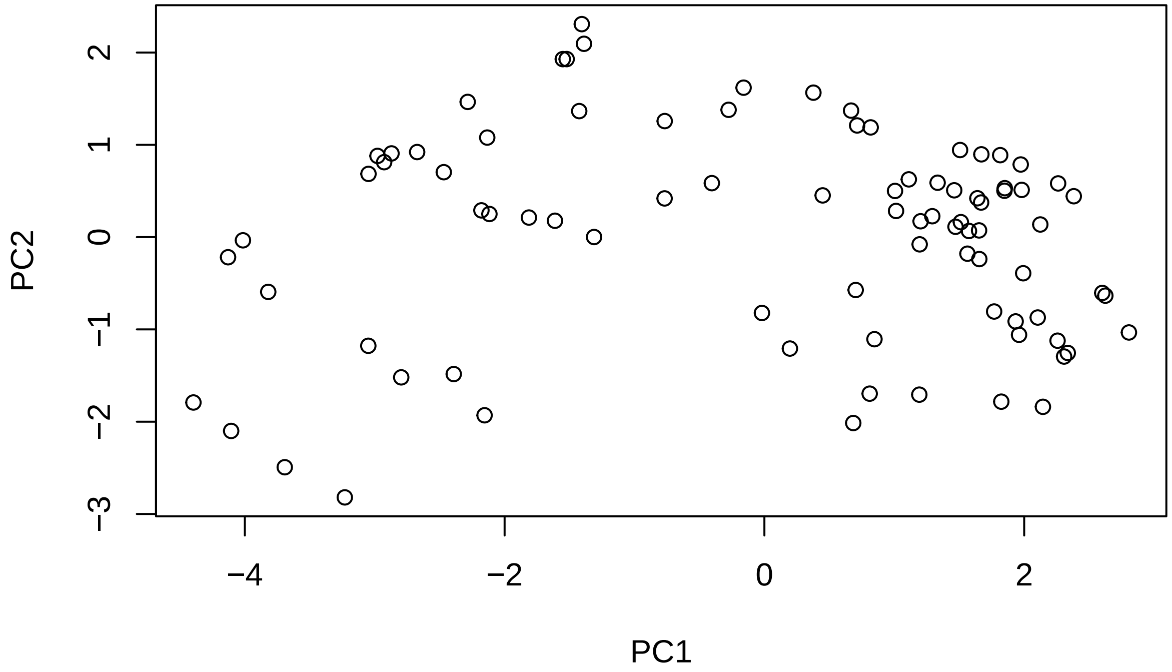
The two most positively correlated variables are chocolate and winpercent.

Principal Component Analysis

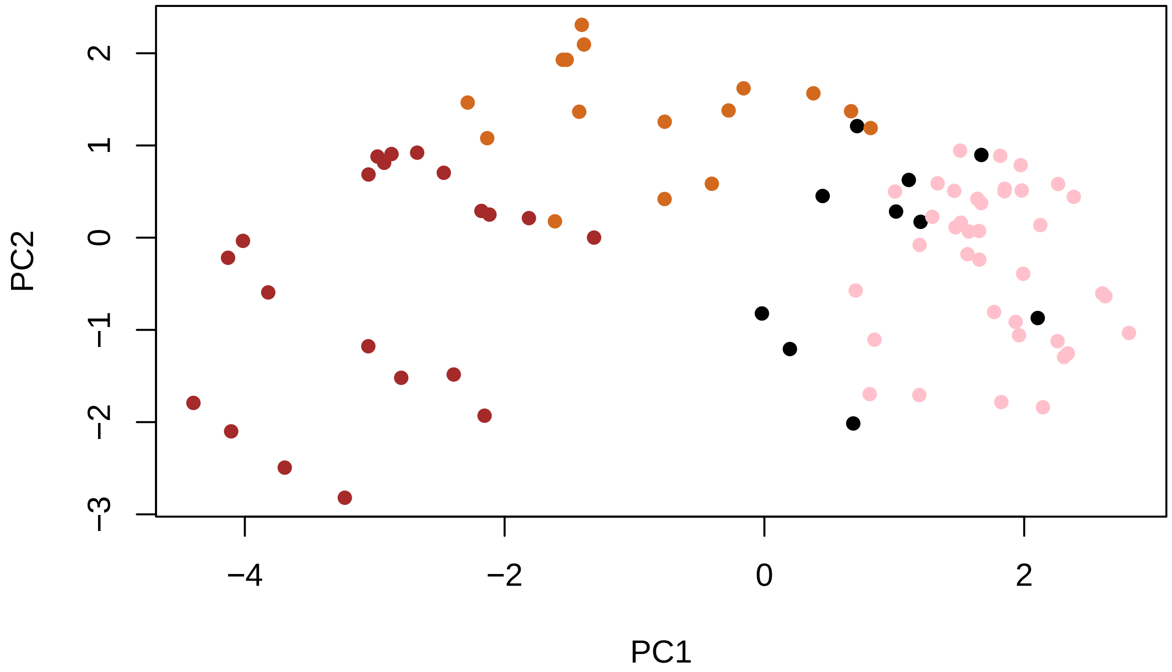
```
pca <- prcomp(candy, scale = TRUE)
summary(pca)
```

```
## Importance of components:
##                           PC1    PC2    PC3     PC4    PC5     PC6     PC7
## Standard deviation     2.0788 1.1378 1.1092 1.07533 0.9518 0.81923 0.81530
## Proportion of Variance 0.3601 0.1079 0.1025 0.09636 0.0755 0.05593 0.05539
## Cumulative Proportion  0.3601 0.4680 0.5705 0.66688 0.7424 0.79830 0.85369
##                            PC8     PC9    PC10    PC11    PC12
## Standard deviation     0.74530 0.67824 0.62349 0.43974 0.39760
## Proportion of Variance 0.04629 0.03833 0.03239 0.01611 0.01317
## Cumulative Proportion  0.89998 0.93832 0.97071 0.98683 1.00000
```

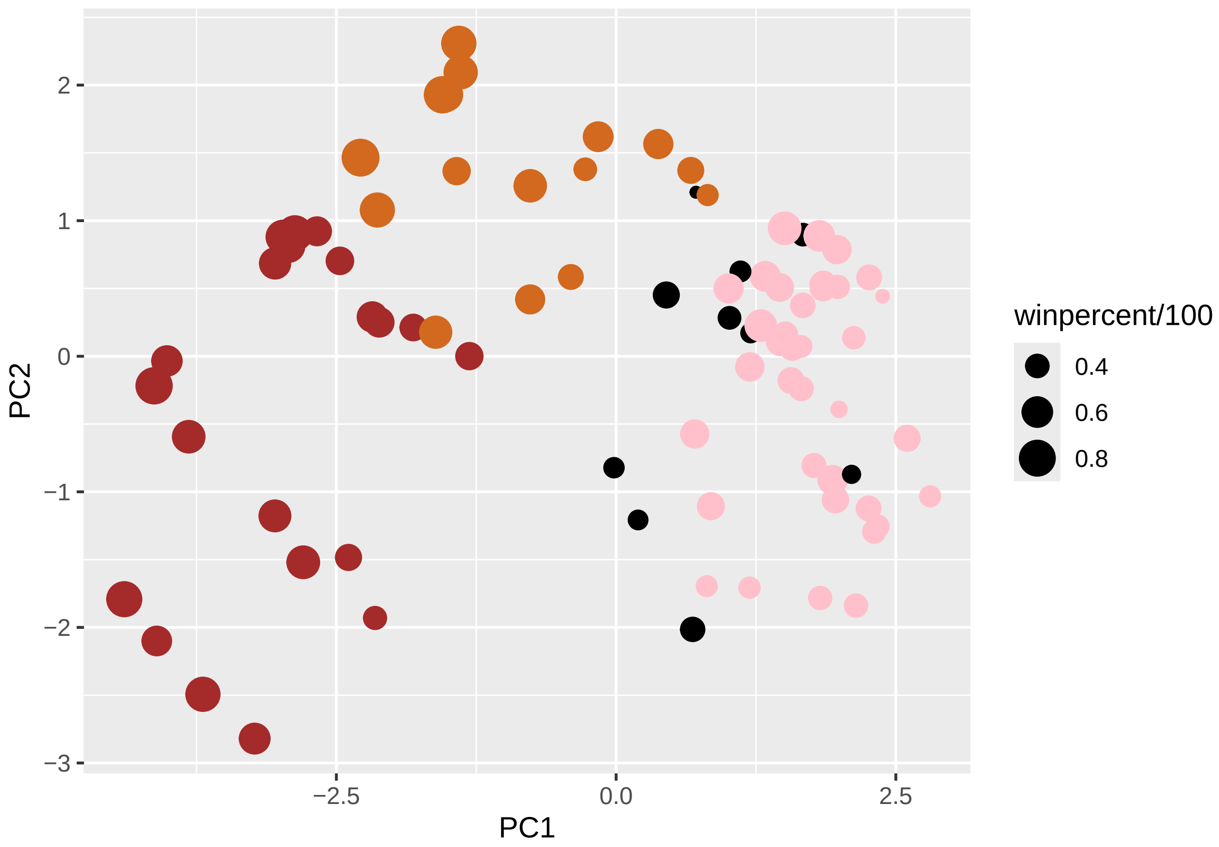
```
plot(pca$x[,1:2])
```



```
plot(pca$x[,1:2], col=my_cols, pch=16)
```

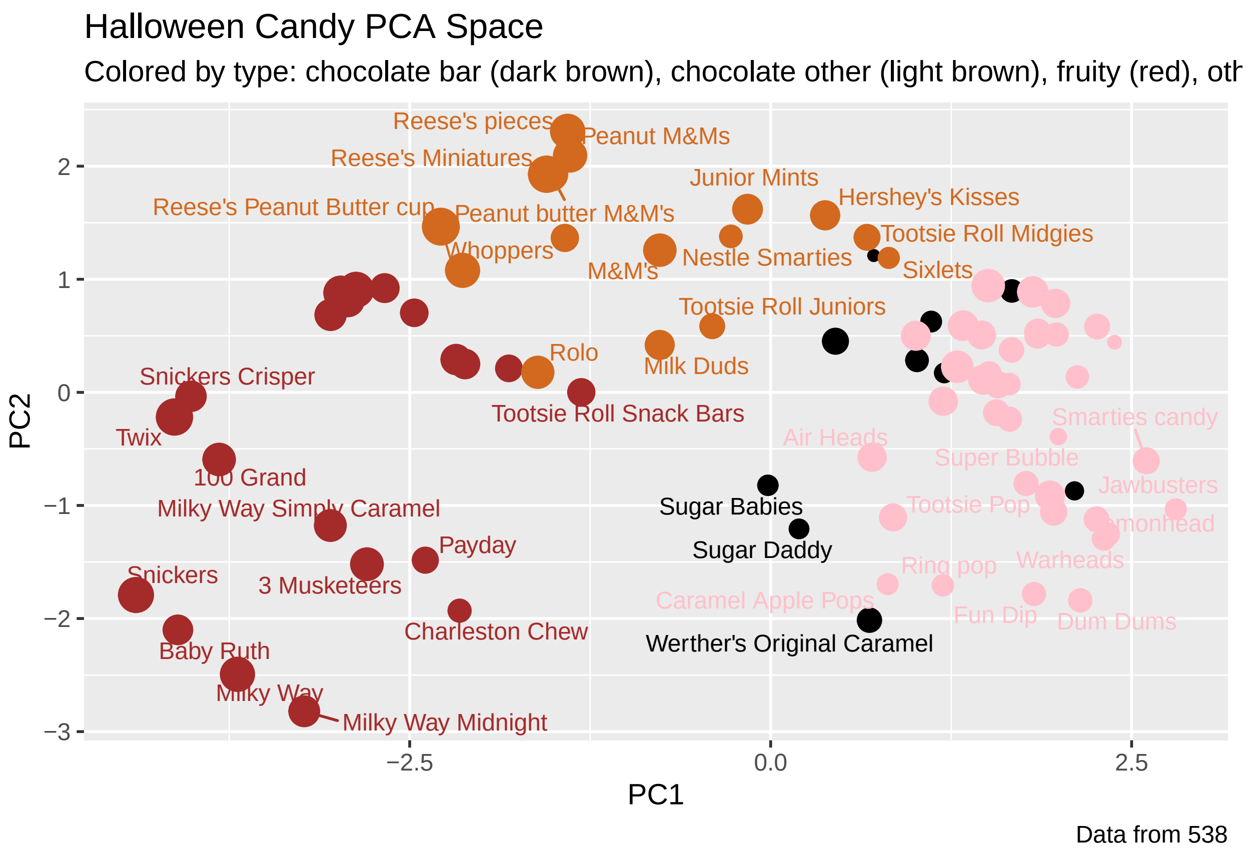


```
# Make a new data-frame with our PCA results and candy data
my_data <- cbind(candy, pca$x[,1:3])

p <- ggplot(my_data) +
        aes(x=PC1, y=PC2,
            size=winpercent/100,
            text=rownames(my_data),
            label=rownames(my_data)) +
        geom_point(col=my_cols)

p
```



```
p + geom_text_repel(size=3.3, col=my_cols, max.overlaps = 7)  + theme(legend.position = "none") + labs(t
```

```
## Warning: ggrepel: 44 unlabeled data points (too many overlaps). Consider
## increasing max.overlaps
```



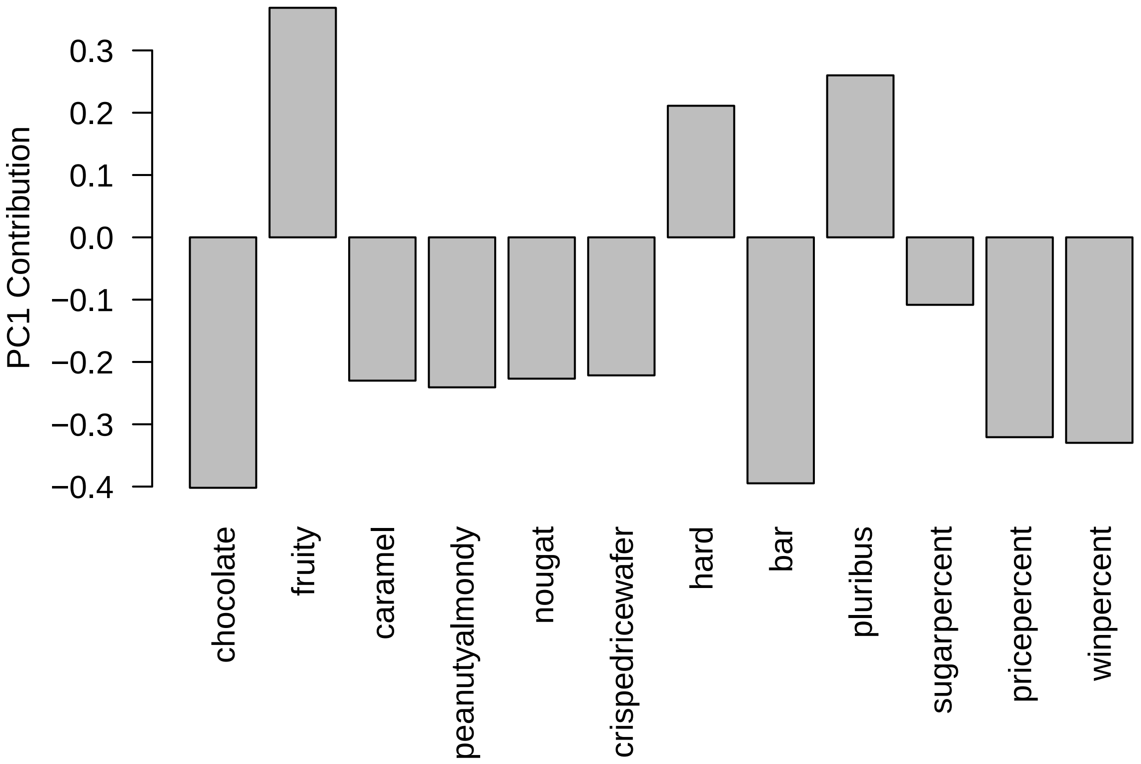
plotly element was not run in the final report because it could not be rendered into pdf

```
library(plotly)
```

```
##
## Attaching package: 'plotly'

## The following object is masked from 'package:ggplot2':
##
##     last_plot

## The following object is masked from 'package:stats':
##
##     filter

## The following object is masked from 'package:graphics':
##
##     layout
```

```
#ggplotly(p)
```

```
par(mar=c(8,4,2,2))
barplot(pca$rotation[,1], las=2, ylab="PC1 Contribution")
```



Q24. What original variables are picked up strongly by PC1 in the positive direction? Do these make sense to you?

The variables fruity, hard, and, pluribus are picked up strongly in PC1. These make sense to me, most people don't prefer harder, fruit flavored candies.