Prior and Posterior Beliefs using the Data101 Survey

By: Yousef Naam

Prior: Probability a Data 101 participant can roll their tongue

table(ExpandedF22DataSurveyAnonymized$V12

Yes: 212

No: 84

What: 11

nrow(ExpandedF22DataSurveyAnonymized[ExpandedF22DataSurveyAnonymized$V12=="Yes",])/nrow(ExpandedF22DataSurveyAnonymized)

Yes: 0.6883117

nrow(ExpandedF22DataSurveyAnonymized[ExpandedF22DataSurveyAnonymized$V12=="No",])/nrow(ExpandedF22DataSurveyAnonymized)

No: 0.2727273

Without any other information, there is a 68.83% chance that the participant can roll their tongue, and a 27.27% chance they cant.

P(CanRoll) = 0.6883117 P(CantRoll) = 0.2727273

Do they prefer warmer temps?

```
table(ExpandedF22DataSurveyAnonymized$V9)

Cooler       Warmer

  182          125
table(ExpandedF22DataSurveyAnonymized$V12,ExpandedF22DataSurveyAnonymized$V9)

            Cooler     Warmer
 No           54          30
 What?         7           4
 Yes         121          91
```

P(Warmer) = 0.4058442

P(Warmer | CanRoll) = 91/212 = 0.43

P(Warmer | CantRoll) = 30/84 = 0.36

P(CanRoll | Warmer) = P(Warmer | CanRoll) * P(CanRoll)/P(Warmer) = 0.43 * 0.688 / 0.4058 = 0.729

P(CantRoll | Warmer) = P(Warmer | CantRoll) * P(CantRoll)/P(Warmer) = 0.36 * 0.273 / 0.4058 = 0.242

Support P(CanRoll | Warmer) = Percentage of people who can roll their tongue and like it warmer = 91 / 307 = 29.6%

Support P(CantRoll | Warmer) = Percentage of people who cant roll their tongue and like it warmer = 30/307 = 9.77%

What if they have iphones?

```
table(ExpandedF22DataSurveyAnonymized[ExpandedF22DataSurveyAnonymized$V13=="iPhone"&ExpandedF22DataSurveyAnonymized$V9=="Warmer",]$V12)
No What?  Yes
 29     3    76
```

P(Warmer + iPhone) = 118/307 = 0.384

P(Warmer + iPhone | CanRoll) = 76/212 = 0.358

P(Warmer + iPhone | CantRoll) = 29/84 = 0.3452

P(CanRoll | Warmer + iPhone) = 0.358 * 0.688 / 0.384 = 0.6414

P(CantRoll | Warmer + iPhone) = 0.3452 * 0.273 / 0.384 = 0.245

Support P(CanRoll | Warmer + iPhone) = Percentage of people who CAN roll their tongues, like warmer temps, and use iphones = 76/307 = 24.75%

Support P(CantRoll | Warmer + iPhone) = Percentage of people who CANT roll their tongues, like warmer temps, and use iphones = 29/307 = 9.45%

See the dress and Blue and Black?

```
table(ExpandedF22DataSurveyAnonymized[ExpandedF22DataSurveyAnonymized$V13=="iPhone"&ExpandedF22DataSurveyAnonymized$V9=="Warmer"&ExpandedF22DataSurveyAnonymized$V3=="Blue and black",]$V12)
No  Yes
11   43
```

P(Warmer + iPhone + BlueAndBlack) = 54/307 = 0.1759
P(Warmer + iPhone + BlueAndBlack | CanRoll) = 43 / 212 = 0.2028
P(Warmer + iPhone + BlueAndBlack | CantRoll) = 11 / 84 = 0.131

P(CanRoll | Warmer + iPhone + BlueAndBlack) = 0.2028 * 0.688 / 0.1759 = 0.7932
P(CantRoll | Warmer + iPhone + BlueAndBlack) = 0.131 * 0.273 / 0.1759 = 0.2033

Support P(CanRoll | Warmer + iPhone + BlueAndBlack) = Percentage of people who CAN roll their tongues, like warmer temps, use iphones, and see the dress as blue and black = 43/307 = 14%

Support P(CantRoll | Warmer + iPhone + BlueAndBlack) = Percentage of people who CANT roll their tongues, like warmer temps, use iphones, and see the dress as blue and black = 11/307 = 3.58%

How can I use this information?

- Determine if Data 101 students prefer a warmer environment while being able to roll their tongue
- Knowing that they can roll their tongue, they have a 72% chance of preferring a warmer environment
- If they can roll their tongue, and like warmer weather, then they have a 24.75% chance of having an iphone.
- Those who are able to see the dress in blue and black, have an iphone, and prefer warmer weather are more likely to be able to roll their tongues 14%.