ASSIGNMENT 4

***Data:****The World Values Survey is an ongoing worldwide survey that polls the world population about perceptions of life, work, family, politics, etc. The most recent phase of the survey that polled 77,882 people from 57 countries estimates that 36.2% of the world's population agrees with the statement "Men should have more right to a job than women." The survey also estimates that 13.8% of people have a university degree or higher, and that 3.6% of people fit both criteria.*

**Given:**

Let,

A: Event that people agree to the given statement.

B: Event that people have university degree or higher.

N = Total number of people surveyed = 77,882

P(A) = Probability of people agreeing with given statement = 0.362

P(B) = Probability of people who have university degree or higher = 0.138

P(AՈB) = Number of people agreeing with given statement and have university

or higher degree = 0.036

**Question 1:** Are agreeing with the statement "Men should have more right to a job than women" and having a university degree or higher disjoint events?

**Answer:** The events agreeing with the statement "Men should have more right to a job than women" and having a university degree or higher cannot be considered as disjoint events. As the survey states that 3.6% (not equal to zero) people fit in both criteria.

Using R command we get,

> p\_a=0.362

> p\_b=0.138

> p\_a\_and\_b=0.036

> ifelse(p\_a\_and\_b==0,"Two events are disjoint","Two events are not disjoint")

[1] "Two events are not disjoint"

**Question 2:** Draw a Venn diagram summarizing the variables and their associated probabilities.

**Answer:**

A: Event that people agree to the given statement.

B: Event that people have university degree or higher.

P(AՈB) = 0.036

P(only A) = 0.362-0.036 P(only B) = 0.138-0.036

= 0.326 = 0.102

Fig: Venn diagram representing given Data.

Using R,

>library(“Venndaigram”)

>draw.pairwise.venn(area1 = p\_a,

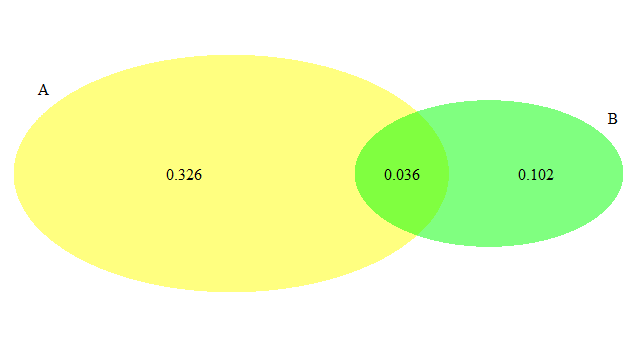
+ area2 = p\_b,

+ cross.area = p\_a\_and\_b,

+ lty = "blank",

+ fill = c("yellow", "green"),

+ category = c("A","B"))



**Question 3:** What is the probability that a randomly drawn person has a university degree or higher or agrees with the statement about men having more right to a job than women?

**Answer:** P(AUB) = Probability that a randomly drawn person has a university degree or higher or agrees with the statement about men having more right to a job than women.

Therefore, P(AUB) = P(A)+P(B)-P(AՈB)

= 0.362 + 0.138 – 0.036

**=** 0.464

Using R command,

> union\_a\_b=p\_a+p\_b-p\_a\_and\_b;union\_a\_b

[1] 0.464

**Question 4:** What percent of the world population do not have a university degree and disagree with the statement about men having more right to a job than women?

**Answer:** Percent of the world population do not have a university degree and disagree with the statement about men having more right to a job than women = 53.6%.

P(B’ՈA’) = P(AUB)’ = 1 – P(AUB) = 1 – 0.464 = 0.536

Therefore, % of people = (0.536) \*100 = 53.6%

Using R command,

> p\_bc\_and\_ac=1-union\_a\_b;p\_bc\_and\_ac

[1] 0.536

> percent=p\_bc\_and\_ac\*100;percent

[1] 53.6

**Question 5:** Does it appear that the event that someone agrees with the statement is independent of the event that they have a university degree or higher?

**Answer:** Twoevents A and B are said to be independent if P(AՈB)=P(A)\*P(B)

P(AՈB) = 0.036 and P(A)\*P(B) = 0.362\*0.138 = 0.0499

Therefore, the events A and B are not independent.

Using R command,

> ifelse(p\_a\*p\_b==p\_a\_and\_b,"Two events are independent" ,

+ "Two events are not independent")

[1] "Two events are not independent"

**Question 6:** What is the probability that at least 1 in 5 randomly selected people agree with the statement about men having more right to a job than women?

**Answer:** P(at least 1 in 5 people agree) = 1- P(none out of 5 agree)

= 1 – P(person disagree)^5

= 1- (1-0.362)^5

= 1- 0.638^5

= 0.8942

Using R,

> p\_1of5\_agree=(1-(1-p\_a)^5); p\_1of5\_agree

[1] 0.8942931

***Data:****As of 2009, Swaziland had the highest HIV prevalence in the world. 25.9% of this country's population is infected with HIV. The ELISA test is one of the first and most accurate tests for HIV. For those who carry HIV, the ELISA test is 99.7% accurate. For those who do not carry HIV, the test is 92.6% accurate. If an individual from Swaziland has tested positive, what is the probability that he carries HIV? Create a tree diagram to calculate probability*

**Question 7:** If an individual from Swaziland has tested positive, what is the probability that he carries HIV?

**Answer:**

Let,

A = Event that the person selected has HIV.

B = Event that the person is tested Positive.

P(A) =Probability that the person selected has HIV = 0.259

P(B|A)=Probability that the person tested positive given that he had HIV= 0.997

P(B’|A’) = Probability that the person doesn’t test positive given that he did not

have HIV = 0.926

P(A|B) = An individual from Swaziland has tested positive, then the probability

that he carries HIV =?

Tree diagram,

Tests 0.997\*0.259=0.2582

0.997 Positive

Person having

HIV

0.003 Tests 0.003\*0.259=0.0007

0.259 Not Positive

Tests 0.074\*0.741=0.0548

Positive

0.741 0.074

Person not having

HIV

0.926 Tests 0.926\*0.741=0.6862

Not Positive

Required Probability,

P(A|B) = P(A and B) = 0.2582 = 0.8249

P(B) 0.313

Therefore, if an individual from Swaziland has tested positive, then the probability that he carries HIV is 0.8249.

**Question 8:** According to a 2013 Gallup poll, worldwide only 13% of employees are engaged at work (psychologically committed to their jobs and likely to be making positive contributions to their organizations). Among a random sample of 10 employees, what is the probability that 8 of them are engaged at work?

**Answer:**

Here, the given data follows binomial distribution with probability of success i.e., employers being engaged at work is 0.13.

Let, X = Number of employers engaged in work.

n=10 and x= 8

using R command we get,

> dbinom(8, size=10,prob=0.13)

[1] 2.77842e-06

The probability that 8 of them are engaged at work is 2.77842e-06.

**Question 9:** Recent study: “Facebook users get more than they give”

* friend requests: 40% made, 63% received at least one
* likes: liked 14 times, had their content “liked” 20 times, on average
* messages: sent 9 messages, received 12, on average
* tags:12% tagged a friend in a photo, but 35% tagged other findings:
* 25% considered power users
* average Facebook user has 245 friends  
  P(70 or more power user friends) =?

**Answer:**

X = Number of power user friends

The data represents binomial distribution, where probability of success is 0.25.

Here, n=245, p = 0.25 , q = 0.75

R%equired probability,

P (x ≥ 70) =P (x=70) +P (x=71) +P (x=72) +……+P (x=245) =?

> sum(dbinom(70:245,245,0.25))

[1] 0.112763

OR,

mean = np = 61.25 > 5 , variance = npq = 45.937 , sd=√npq = 6.7777

Therefore, using Normal approximation in this case is preferred.

To find,

P ( ≥ )

= P (z ≥ )

= P (z ≥ 1.291)

= 0.09835184

Therefore, P (70 or more power user friends) is 0.0983.

R command for same is,

>1-pnorm(1.291,0,1)

[1] 0.09835184

**Question 10:** According to a 2014 Gallup poll, 56% of uninsured Americans who plan to get health insurance say they will do so through a government health insurance exchange. What is the probability that in a random sample of 10 people exactly 6 plan to get health insurance through a government health insurance exchange?

**Answer:**

Let,

X = Number of people who plan to get health insurance through a government

health insurance exchange.

The data represents Binomial distribution.

Here, n = 10, x = 6 and p = 0.56

The probability that in a random sample of 10 people exactly 6 plan to get health insurance through a government health insurance exchange is, 0.2427.

Using R command to calculate probability we get,

>dbinom(6,10,0.56)

[1] 0.2427494