Exercise #4

Q1: In a study of violent victimization of women a d men, Porcerilli et al. (A-2) collected information from 679 women and 345 men aged 18 to 64 years at several family practice centers in the metropolitan Detroit area. Patients filled out a health history questionnaire that included a question about victimization. The following table shows the sample subjects categories are defined as no victimization, partner victimization (and not by others), victimization by person other than partners (family member, friends or strangers) and those who reported multiple victimization

	No Victimization (N)	Partners (P)	Non-partners (T)	Multiple partners (L)	Total
Women(W)	611	34	16	18	679
Men(M)	308	10	17	10	345
Total	919	44	33	28	1024

Suppose we pick a subject at random from this group. Find

1. The probability that this subject will be a woman is
   $P(W) = \frac{n(w)}{n(\Omega)} = \frac{679}{1024} = 0.6631$
2. The probability that the subject will be a woman and have experienced partner abuse is $P(W \cap P) = \frac{n(w \cap P)}{n(\Omega)} = \frac{34}{1024} = 0.0332$
3. Suppose we picked a man at random knowing that he is a man , then the probability that he experienced abuse from non- partner
   $$P(T|M) = \frac{n(T \cap M)}{n(M)} = \frac{17}{345} = 0.0493$$
4. The probability that is a man or someone who experienced abuse from partner
   $$P(M \cup P) = P(M) + P(P) - P(M \cap P)$$
   $$= \frac{345}{1024} + \frac{44}{1024} - \frac{10}{1024} = 0.3701$$
5. The relation between being a man and being a woman is
   a. Disjoint b. **exhaustive and disjoint** c. independent d. exhaustive

- $P(M \cap W) = P(\phi) = 0$, *so W and M are disjoint*
- $P(M \cup W) = \frac{345+679}{1024} = P(\Omega) = 1$, *so W and M are* exhaustive events.
- $P(M \cap W) = P(M).P(W) \gg\gg$

  $0 \neq \left(\frac{345}{1024}\right)\left(\frac{679}{1024}\right)$ *so W and M are not independint*

or $P(M|W) = P(M) \gg$ $P(M|W) = \frac{n(M \cap W)}{n(W)} = \frac{0}{679} = 0 \gg$ $0 \neq \frac{345}{1024}$

or $P(W|M) = P(W)$

Q2: Fernando et al. (A-s) studied drug-sharing among injection drug users in South Bronx in New York City. Drug user in New York City use the term "split a bag" or "get down a bag" to refer the practice of dividing a bag of heroin or other injectable substances. A common practice includes splitting drugs after they are dissolved in a common cooker, a procedure with considerable HIV risk. Although this practice is common, little is known about the prevalence of such practice, the researchers asked injection drug user in four neighborhoods in the South Bronx if they ever "got down on" drug in bags or shots. The results classified by gender and splitting practice are given below:

Gender	Split Drugs (S)	Never Split Drugs (N)	Total
Male(M)	349	324	673
Female(F)	220	128	348
Total	569	452	1021

If a person picked at random. Find the probability that

1. He is never split drugs and is female $P(N\cap F)=\frac{n(N\cap F)}{n(\Omega)}=\frac{128}{1021}=0.1254$

2. She admits to splitting drug, given that she is female ……….

$$P(S|F)=\frac{n(S\cap F)}{n(\mathrm{F})}=\frac{220}{348}=0.6322$$

3. He is not a man is $P(M^C)=1-P(M)=1-\frac{673}{1021}=0.3408$
4. $P(Male^C\cap Split\ Drugs)=P(F\cap S)=\frac{220}{1021}=0.2155$
5. $P(\ Males\ \cup\ Split\ Drugs)=$

$$P(M\cup S)=P(M)+P(S)-P(M\cap S)=\frac{673}{1021}+\frac{569}{1021}-\frac{349}{1021}=0.8746$$

6. P(Male | Split Drugs) = $P(M|S)=\frac{n(S\cap M)}{n(S)}=\frac{349}{569}=0.6134$
7. P (Male) = **P(M) =673/1021 =0.6592**

8. The relation between being a man and Never split drug is
   a. Disjoint   b. exhaustive   c. independent   **d. Dependent**

- $P(M\cap N)=\frac{324}{1021}\neq 0$, *so W and N are **not** disjoint.*
- $\mathrm{P}\ (M\cup N)=P(M)+P(N)-P(M\cap N)=\frac{673}{1021}+\frac{452}{1021}-\frac{324}{1021}=0.7845$

  $\mathrm{P}\ (M\cup N)\neq 1$, *so W and N are **not*** exhaustive events.

- *To check* $\mathrm{P}\ (M\cap N)=P(M).P(N)$ ⋙

  $\mathrm{P}\ (M\cap N)=\frac{324}{1021}=0.3173$; $P(M).P(N)=\left(\frac{673}{1021}\right)\left(\frac{452}{1021}\right)=0.2918$

$\mathrm{P}\ (M\cap N)\neq P(M).P(N)$ *so W and M are not independint(Dependent)*

$or\ \ check\ \mathrm{P}\ (M|N) = P(M) \gg \quad \boldsymbol{P(M|N)} = \frac{n(M\cap N)}{n(\mathrm{N})} = \frac{324}{452} =$

$$\boldsymbol{P(M)} = \frac{\mathbf{673}}{\mathbf{1021}} \gg SO\ \ \mathrm{P}\ (M|N) \neq\ P(M)$$

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Q3: suppose that dental clinic has 12 nurses classified as follows

The experiments is to randomly choose one of these nurses. Consider the following events:

C= the chosen nurse has children.

N= the chosen nurse works night shift.

Nurse	1	2	3	4	5	6	7	8	9	10	11	12
Has Children	Yes	No	No	No	No	Yes	No	No	Yes	No	No	No
Works at nigh	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes

	N	N^C	Total
C	**2**	**- -1--**	**3**
C^C	**-- 6--**	**--3-**	**--9--**
Total	**8**	**--4--**	**--12--**

Complete the table , then answer

a. Find the probabilities of the following:
   1- the chosen nurse has children $\boldsymbol{P(C) = 3/12 = 0.25}$
   2- the chosen nurse works night shift $\boldsymbol{P(N) = 8/12 = 0.6667}$
   3- the chosen nurse has children and works night shifts
      $\boldsymbol{P(C \cap N) = 2/12 = 0.167}$
   4- the chosen nurse has children and doesn't work night shifts
      $\boldsymbol{P(C \cap N^C) = 1/12 = 0.0833}$

b. Find the probabilities of choosing a nurse who works at night given that she has children

   $P(N|C) = \frac{P(N\cap C)}{P(C)} = \frac{n(N\cap C)}{n(C)} = \frac{2}{3} = 0.6667$

c. Are having children and work at night disjoint? **No**

   $P(C \cap N) = \frac{2}{12} \neq 0\ ,so\ C\ and\ N\ are\ \boldsymbol{not}\ disjoint$

d. Are having children and work at night exhaustive? **No**

$$P\,(C \cup N) = P(C) + P(N) - P(C \cap N) = \frac{\mathbf{3}}{\mathbf{12}} + \frac{\mathbf{8}}{\mathbf{12}} - \frac{\mathbf{2}}{\mathbf{12}} = 0.75$$

$P\,(C \cup N) \neq 1$, $\quad$ *so C and N are **not*** exhaustive events.

e. Are having children and work at night independent? **Yes**

To check $P\,(C \cap N) = P(C).P(N) \gg\gg$

$P\,(C \cap N) = \frac{2}{12} = 0.1667 \quad ; \quad P(C).P(N) = \left(\frac{3}{12}\right)\left(\frac{\mathbf{8}}{\mathbf{12}}\right) = 0.1667$

$P\,(C \cap N) = P(C).P(N)$ *so C and N are independint*

or *check* $P\,(N|C) = P(N) \gg \quad \boldsymbol{P(N|C)} = 0.6667$

$\boldsymbol{P(N) = 0.6667} \gg SO\ P\,(N|C) = P(N)$

H.W

Laveist and Nuru-Jeter (A-4) conducted a study determined if doctor-patient race concordance was associated with greater with care. Toward that end, they collected a national sample of African=American, Caucasian, Hispanic and Asian-American respondents. The following table classifies the race of the subject as well as the race of their physician:

		Patient's Race				
		Caucasian F	African American G	Hispanic Q	Asian-American R	Total
Physician Race	White A	779	436	406	475	1796
	African American B	14	162	15	5	196
	Hispanic C	19	17	128	2	166
	Asian-American Islander D	68	75	71	203	417
	Other E	30	55	56	4	145
	Total	910	745	676	389	2720

If we a randomly selected subject, then

1. The probability that a randomly selected subject will have an Asian/Pacific-Islander physicians…**P(D)=0.1533**……

2. The probability that an African-America subject will have an African-American Physician is…**P(B | G) =0.2174**…..

3. The probability that a randomly selected subject will have as Asian-American and have an Asian/Pacific-Islander Physician…**P(R∩D)=0.075**…..

4. The probability that a subject chosen at random will be Hispanic or have a Hispanic Physician……**P(C∪Q)=0.2625**…..

5. The relation between Physician Race is Hispanic and Patient's Race is African American is
   a.Disjoint b. exhaustive c. independent **d.dependent**

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