Problem 2. In 1994, Orenthal James Simpson was accused of murderning his ex-wife, Nicole Brown Simpson. In this problem, we will examine one of the arguments presented in his defence at his murder trial [4].

(1). Approximately 3.5 million women are battered every year in the United States. Assume that they are all battered by their partners. The total of $1,432$ women were murdered by their previous batterers in the United States during 1992. Compute the conditional probability

$$P\left(\begin{array}{c|c} \text{American woman was murdered by her batterer during 1992} & \text{American woman was battered during 1992} \end{array}\right).$$

(It may be most convenient to round this number as a reciprocal of an integer.)

Space for your solution:

$$P\left(\begin{array}{c|c} \text{American woman was murdered by her batterer during 1992} & \text{American woman was battered during 1992} \end{array}\right) \approx \frac{1,432}{3,500,000} \approx \frac{1}{2,444}.$$

(2). During the O. J. Simpson's murder trial, Alan Dershowitz, who "made some appearances in court but mainly served as a member of O. J.'s defense team from afar while busy with his day job, teaching at Harvard Law School" [5] as a Professor of Law, claimed that Simpson's previous accusation of spousal abuse was not particularly relevant to the case, because only about one in $2,500$ men who battered their partners went on to kill them. Is Dershowitz's numerical claim supported by the statistics mentioned above?

Space for your solution:

Given that the figure $\frac{1}{2,444}$ found in the previous subproblem is close enough to the $\frac{1}{2,500}$ cited by Alan Dershowitz, we can conclude that the Professor's numerical claim is supported by the cited statistical evidence.

[4]The statistical data in this problem are taken from William P. Skorupski, Howard Wainer (2015) "The Bayesian flip: Correcting the prosecutor's fallacy", Significance, Volume 12, Issue 4, `https://rss.onlinelibrary.wiley.com/doi/epdf/10.1111/j.1740-9713.2015.00839.x` unless noted otherwise.

[5]Natalie Finn (2024), "Absolutely 100 Percent Not Guilty": 25 Bizarre Things You Forgot About the O. J. Simpson Murder Trial `https://www.eonline.com/news/1047537/absolutely-100-percent-not-guilty-25-bizarre-things-you-forgot-about-the-o-j-simpson-murder-trial`

(3). The total of $4,936$ women were murdered in the United States in 1992. Approximately 34% of murdered women are murdered by their intimate partners [6]. Estimate

- the number of women who were murdered by their partners, and
- the number of women murdered by someone else,

in 1992.

Space for your solution:

Using the total and the percentage mentioned in this subproblem, we can estimate the total number of women murdered in 1992 by their partners as $4,936 \cdot 34\% \approx 1,678$, and by somebody other than their partner as $4,936 - 1,678 = 3,258$.

(4). In 1992, the total population of women in the United States was approximately 125 million. Using all statistical information given and computed so far, and assuming that

$$P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{battered by her partner}\\ \text{during 1992}\end{array}\middle|\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered by someone else}\\ \text{during 1992}\end{array}\right) = P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{battered by her partner}\\ \text{during 1992}\end{array}\right),$$

estimate the number of women who were battered by their partners, and murdered by someone other than their partner, in 1992.

Space for your solution:

Denoting the number in question as x and using the previous subproblem, we get:

$$P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{battered by her partner}\\ \text{during 1992}\end{array}\middle|\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered by someone else}\\ \text{during 1992}\end{array}\right) = \frac{x}{3,258}.$$

The data from this and the first subproblem yield: $P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{battered by her partner}\\ \text{during 1992}\end{array}\right) = \frac{3.5}{125}$.

The independence of events assumed in this subproblem leads to the proportion $\frac{x}{3,258} = \frac{3.5}{125}$, which can be solved for x:

$$x = \frac{3,258 \cdot 3.5}{125} \approx 91.$$

[6] See "Female Murder Victims and Victim-Offender Relationship, 2021" by the Bureau of Justice Statistics `https://bjs.ojp.gov/female-murder-victims-and-victim-offender-relationship-2021`. Note that we are assuming that this percentage in 1992 was similar to the one reported for 2021.

(5). Using all statistical data given or found so far, estimate the probability

$$P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered by her partner}\\ \text{during 1992}\end{array}\,\middle|\,\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{battered}\\ \text{during 1992}\end{array}\cap\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered}\\ \text{during 1992}\end{array}\right).$$

Space for your solution:

$$P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered by her partner}\\ \text{during 1992}\end{array}\,\middle|\,\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{battered}\\ \text{during 1992}\end{array}\cap\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered}\\ \text{during 1992}\end{array}\right)\approx\frac{1,432}{1,432+91}\approx 94\%.$$

(6). In view of all statistical data given or computed so far, do you think Professor Dershowitz gave the court and the jury a reasonable argument?

Space for your solution:

The relevance of the prior spousal abuse to the murder case is in the difference between

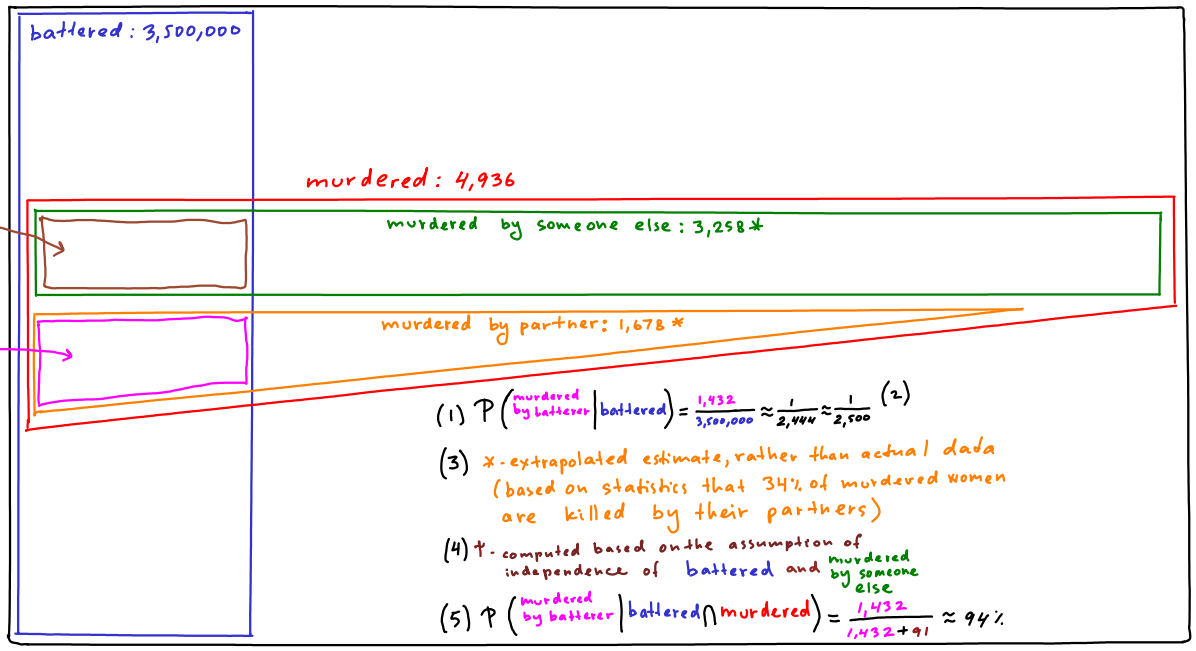
$$P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered by her partner}\\ \text{during 1992}\end{array}\,\middle|\,\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered}\\ \text{during 1992}\end{array}\right)\approx 34\% \quad \text{and}$$

$$P\left(\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered by her partner}\\ \text{during 1992}\end{array}\,\middle|\,\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{battered}\\ \text{during 1992}\end{array}\cap\begin{array}{c}\text{American}\\ \text{woman was}\\ \text{murdered}\\ \text{during 1992}\end{array}\right)\approx 94\%.$$

Mistaking the first for the second is called *the defence attorney's fallacy*, which Professor Dershowitz certainly committed. His numerical claim was correct, but irrelevant; his assertion of irrelevance of prior spousal abuse to the murder case was supported neither by what he himself presented to the court, nor by the additional data considered here. More statistical data is needed to settle that issue, but if the simplifying assumptions made here [a] are even remotely reasonable, Professor Dershowitz's irrelevance claim is not merely unsubstantiated, but dramatically wrong: *the information about O. J. Simpson's history of spousal abuse was very relevant to his murder case.*

[a] In (1), we assumed that all battered women are battered by their partners; in (3), we extrapolated the data from 2021 back to 1992; in (4), we assumed independence of the two events. Given their continuing interaction, we also considered O. J. Simpson as a current (rather than former) partner of the victim.

American Women in 1992 : 125,000,000



battered by their partner, but murdered by someone else : 91 †

murdered by their previous batterers : 1,432

(1) $P\left(\text{murdered by batterer} \mid \text{battered}\right) = \frac{1,432}{3,500,000} \approx \frac{1}{2,444} \approx \frac{1}{2,500}$ (2)

(3) * - extrapolated estimate, rather than actual data (based on statistics that 34% of murdered women are killed by their partners)

(4) † - computed based on the assumption of independence of battered and murdered by someone else

(5) $P\left(\text{murdered by batterer} \mid \text{battered} \cap \text{murdered}\right) = \frac{1,432}{1,432+91} \approx 94\%$

vs. $P\left(\text{murdered by partner} \mid \text{murdered}\right) = 34\%$