

(30 points)

1. Initiative 695 not only reduced car tabs in the State of Washington to \$30 a car, but also it reduced the amount of money available for public transportation across the state. The potential impacts on public transit were much discussed throughout the election season. When votes for the initiative were tallied in the November 1999 election, King County was the only county throughout the state in which a majority did not vote for the initiative. Let's take a look at people's travel habits in 1998 to begin to understand why that might be. The following table contains the results of a question asked of a random sample of the population of the State of Washington about their most common method to travel to work.

	Drive a Car, Truck or Van	No Driving: Public Transit, Bike or Walk	Other	Total
Puget Sound (Not King County)	915	118	50	1083
King County	616	189	34	839
Olympic Peninsula	882	77	37	996
Eastern Washington	1379	178	58	1615
Total	3792	562	179	4533

Source: 1998 Washington State Population Survey

1a. Across the state, what is the rate of the use of alternatives to driving to work?

$$P(A) = \frac{n(A)}{n(S)}$$
 A = # of people who did not drive to work + other  
 S = Total of the entire sample (4533)

$$A = 562 + 179 = 741$$

$$S = 4533$$

$$\frac{741}{4533} = .163 \text{ or } 16.3\%$$

1b. What is the probability that someone would live in King County and not drive?

Joint probability  

$$(A \cap B) = 189$$

$$\frac{189}{4533} = .041$$

A = King County  
 B = not drive

CHECK:  $(A \cap B) = P(A|B)(B)$   
 $= \left(\frac{189}{562}\right) \left(\frac{562}{4533}\right) = .041$

1c. What is the probability that someone living in Eastern Washington would also use public transportation?

$$P(P|E) = \frac{P(P \cap E)}{P(E)}$$

$$\frac{\frac{178}{4533}}{\frac{1615}{4533}} = \frac{178}{1615} = .1102 \Rightarrow 11\%$$

1d. Given that a person drives, what is the probability that he or she would live in Eastern Washington? What is the probability that he or she would live in King County?

$$P(A|B) = \frac{1379}{3792} \frac{(A \cap B)}{(B)}$$

$$A = \text{EASTERN WA}$$

$$B = \text{drive}$$

$$= .36$$

$$P(A|B) = \frac{616}{3792} \frac{(A \cap B)}{(B)}$$

$$A = \text{King County}$$

$$B = \text{drive}$$

$$= .16$$

1e. Is one's likelihood of driving associated with where one lives? What evidence supports your answer?

Yes - you must examine whether the events are independent, and in this case, they are not.

$$P(A|B) = P(A)$$

$$P(B|A) = P(B)$$

$$P(B \cap A) = P(A)P(B)$$

A = driving, B = King

$$P(D|King) = \frac{1616}{839} = 1.937 \neq$$

$$P(D) = \frac{3792}{4533} = 0.837$$

So, they are not independent - ~~where~~ one's likelihood of driving is associated with where one lives.

1f. Write a paragraph discussing your findings for the nontechnical reader and suggesting some reasons for the November 1999 election results.

We've found that throughout Washington, only 16.5% of the residents use alternatives to driving to get to work (alternatives would be public transit, biking, walking, or some other means). King County, which has a public transit system, has a higher percentage <sup>of non-drivers</sup> (compared to the statewide percentage) of people not driving, which is 26.6%. Because other areas, such as Eastern Washington, have limited public transportation, they are less likely to use alternatives to driving <sup>or at least less likely to use public transit.</sup> We also looked at drivers and the probability that any ~~one~~ individual would be from Eastern Washington, where there is limited public transit, and also the likelihood that the driver would live in King County. It is more likely that a driver will be from Eastern Washington than King County (36% compared to 16%).

Hence, one could conclude that those in King County were less likely to vote in favor of I-695 because they use more public transportation <sup>(more non-drivers)</sup> than other Washingtonians. Other areas of the state would presumably be less concerned with the effect on <sup>public</sup> transportation with the passage of I-695 since they ~~are~~ are ~~more~~ more likely to drive than King County residents.

(40 points)

3. The voting habits of U.S. citizens have been cause for concern for quite some time. Only approximately 50% of the voting age population actually voted in the U.S. elections in 1996. Of the inhabitants of inner cities, only about 20% voted.<sup>1</sup>

3a. In a group of 10 people randomly selected from inner city populations of the U.S., what is the probability that five or more voted in the 1996 elections?  $p = .20$

$P(X \geq 5) =$  using the table

$$P(X \geq 5) = P(X=5) + P(X=6) + P(X=7) + P(X=8) + P(X=9) + P(X=10)$$

$$= .0264 + .0055 + .0008 + .0001 + .0000 + .0000$$

$$= .0328$$

In a group of 10 inner city residents randomly selected there is a 3.3% probability that 5 or more of them voted in the 1996 elections ✓

3b. In a group of 10 people randomly selected from the entire U.S. population, what is the probability that five or more of them voted in the 1996 elections?

$$P(X \geq 5) = .2461 + .2051 + .1172 + .0439 + .0098 + .0010$$

$$= .623$$

$n = 10$   
 $p = .50$

In a group of 10 randomly selected Americans, there is a 62% chance that 5 or more of them voted in 1996.

3c. What is the expected number of voters in a random sample of 10 people in the entire U.S. population?

Of 10 random people, if .50 vote, the expected # of voters would be 5.

$p = .50$   
 $q = 1 - .50 = .50$   
 $n = 10$

$\mu = E(x) = np = 10(.5) = 5$  ✓

<sup>1</sup> Adapted from the *New York Times*, Jan. 30, 1997 "Many Black Men Barred from Voting, Study Shows."

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$P(B|A) = \frac{P(A|B)P(B)}{P(A|B)P(B) + P(A|\bar{B})P(\bar{B})}$  }  $P(A)$  or sum of joint

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One possible explanation for some of the non-voters is that those who have been convicted of a felony are disqualified from voting in most states in the U.S. The following data pertain to those people who are ineligible to vote by reason of felony conviction:

- The probability of a male of voting age being ineligible due to a felony conviction, given that he is black, is 14%  $P(\text{Ineligible} | \text{Black}) = .14$
- The probability of a male of voting age being ineligible due to a felony conviction, given that he is non-black, is 4%  $P(\text{Ineligible} | \bar{\text{Black}}) = .04$
- Blacks make up 12 percent of the voting-age male population  $P(B) = .12$

3d. Given that a male is ineligible to vote due to a felony conviction, what is the probability that he is black?  $P(\bar{B}) = 1 - P(B) = 1 - .12 = .88$

$$P(\text{Black} | \text{Ineligible}) = \frac{P(\text{Ineligible} | \text{Black}) P(\text{Black})}{P(\text{Ineligible} | \text{Black}) P(\text{Black}) + P(\text{Ineligible} | \bar{\text{Black}}) P(\bar{\text{Black}})}$$

$$= \frac{(.14)(.12)}{(.14)(.12) + (.04)(.88)}$$

$$= \frac{0.0168}{0.0168 + 0.0352}$$

$$= \frac{0.0168}{0.052} = 0.323 \text{ or } 32.3\%$$

0.323076923

So the probability that a man ineligible to vote b/c of a felony is black is .323.

3e. If there are 10.5 million black males of voting age, how many are barred from voting due to a felony conviction?

$$= (\# \text{ of African American males}) \times P(\text{Ineligible} | \text{Black})$$

$$= 10,500,000 \times .14$$

$$= 1,470,000$$

3f. Experts in voting behavior has said that only 20 percent of convicted felons would have voted (even if they were not barred) because of low voter turnout in their demographic group.

Write 2 paragraphs of the back of this page presenting both the information you are given throughout this question and your findings for the nontechnical reader. Explore the policy implications and offer suggestions for improving representation of the U.S. population in elections.

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3f. Write 2 paragraphs presenting both the information you are given throughout this question and your findings for the nontechnical reader. Explore the policy implications and offer suggestions for improving representation of the US population in elections.

Voting habits in the United States have been the cause of concern for quite some time. The problem is particularly concerning when you compare a few basic numbers. If you take a group of 10 citizens from the inner city and compare their likelihood of voting with 10 citizens from the entire population, the results are dramatic. There is only a 3% chance that 5 or more of those inner city citizens will vote compared to the over 60% chance that 5 or more of those selected from the total population will vote. Generally, voting information shows that 5 out of every 10 people in the general population can be expected to vote.

Many policy analysts are concerned about the role that race may play in these statistics. Almost 1.5 million black men are ineligible to vote as the result of a felony conviction. If a man is black, there is a 14% chance that he will be ineligible to vote as the result of a felony conviction compared to an only 4% chance if the same information is gathered on non-blacks. The comparison is daunting. Black men account for 12% of the total number of men eligible to vote in the United States but make up over 30% of men ineligible to vote as the result of a felony conviction. Clearly, the United States justice system is not color-blind. Policies that contribute to racial equity in the justice system, pursue voter education (particularly in the inner cities), and increase voter participation overall would be crucial first steps towards addressing these issues.

Although the voting turnout for the entire US population in the '96 election ~~is~~ 50%, it was about 30% less for those living in an inner city area. Out of 10 randomly selected individuals there is only a 3.28% chance that 5 or more of them voted in '96 if they are residents of the inner city while there is a 62.3% chance that 5 or more of 10 randomly selected individuals from the general population voted in the 1996 election. The expected voter turnout for 10 people in the general population was 5, ~~150~~ in an inner city there is only a 3.28% chance that the expected turnout was met. Among convicted <sup>male</sup> felons who are banned from voting, 32.3% are black and 67.7% are non-black.

Though there is no clear correlation between being black and living in the inner city, historically many of the inner cities have been inhabited by minorities. This fact, combined with the knowledge that 1.47 million black men will be banned from voting due to a felony conviction, suggests that minorities may be under-represented in many elections. Policies aimed at community-based education on political issues may help people to feel more motivated to vote on issues they feel affect them. Finding ways to offer free transportation to the polls may be helpful in getting people to vote since few people in inner cities tend to have transportation. Without an adequate representation of inner city residents, public policies are likely to under- or misrepresent the needs and wants of these communities + they are likely to continue to be underserved. Organizing groups through existing community-based organizations to encourage these citizens to use their right to vote can equalize the allocation of resources. Additionally, it may be helpful to have some resources available for those who do not speak English as we seek to improve voter turnout in the inner city + minority populations.

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