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3.

a. Marijuana is indicated by $s_1 = s_2 = 0$, leaving the logit to be $logit(\hat{\pi}) = -0.57 + 0.38r - 0.20g$. This value is maximized when $r = 1, g = 0$ (race is white, gender is male).

Alcohol is indicated by $s_1 = 1, s_2 = 0$, leaving the logit to be $logit(\hat{\pi}) = -0.57 + 1.93 + 0.38r + 0.17g$. This value is maximized when $r = 1, g = 1$ (race is white, gender is female).

Cigarettes is indicated by $s_1 = 0, s_2 = 1$, leaving the logit to be $logit(\hat{\pi}) = -0.57 + 0.86 + 0.38r + 0.02g$. This value is maximized when $r = 1, g = 0$ (race is white, gender is female).

b. Disregarding coefficients in logit multiplied by gender indicator variable *g*, the only other explanatory variable left aside from substance indicator is race, *r*. The coefficient for the race term is 0.38 for the log of odds. To get the odds of white using a substance against nonwhites, compute $e^{0.38} = 1.46$.

c. Alcohol is indicated by $s_1 = 1, s_2 = 0$, leaving the logit to be $logit(\hat{\pi}) = -0.57 + 1.93 + 0.38r + 0.17g$. The odds ratio of female over male is then $e^{0.17} = 1.19$.

Cigarettes is indicated by $s_1 = 0, s_2 = 1$, leaving the logit to be $logit(\hat{\pi}) = -0.57 + 0.86 + 0.38r + 0.02g$. The odds ratio of female over male is then $e^{0.02} = 1.02$.

Marijuana is indicated by $s_1 = s_2 = 0$, leaving the logit to be $logit(\hat{\pi}) = -0.57 + 0.38r - 0.20g$. The odds ratio of female over male is then $e^{-0.20} = 0.82$.

d. The logit for females using alcohol, cigarettes, and marijuana are as follows, respectively:

$-0.57 + 1.93 + 0.38r + 0.17$
$-0.57 + 0.86 + 0.38r + 0.02$
$-0.57 + 0.38r - 0.20$

The difference in logit coefficients between alcohol and marijuana is $(1.93 + 0.17) - (-0.20) = 2.30$. The odds ratio of alcohol to marijuana use, for females, is $e^{2.30} = 9.97$.

The difference in logit coefficients between cigarettes and marijuana is $(0.86 + 0.02) - (-0.20) = 1.08$. The odds ratio of cigarettes to marijuana use, for females, is $e^{1.08} = 2.94$.

e. The logit for males using alcohol, cigarettes, and marijuana are as follows, respectively:

$-0.57 + 1.93 + 0.38r$
$-0.57 + 0.86 + 0.38r$
$-0.57 + 0.38r$

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The difference in logit coefficients between alcohol and marijuana is 1.93. The odds ratio of alcohol to marijuana use, for males, is $e^{1.93} = 6.89$.

The difference in logit coefficients between cigarettes and marijuana 0.86. The odds ratio of cigarettes to marijuana use, for males, is $e^{0.86} = 2.36$.

15.
True. For repeated measurements, the assumption of independence overstates the within-subject effects but understates the between-subject effects.