1. (4 marks)

One study classified 452 mothers accordning to their alcohol intake prior to pregnancy recognition and their nicotine intake during pregnancy. The data are in the following table.

Alcohol (ounces /day)	Nicotine (mg/day)		
	None	1-15	16 or more
None	105	7	11
0.01-0.10	58	5	13
0.11-0.99	84	37	42
1.00 or more	57	16	17

Carry out a complete analysis of the association between alcohol and nicotine consumption. That is, describe the nature and strength of this association and assess its statistical significance. Include charts or figures to display the association.

Answers:
Ho: Alcohol & Nicotine are independent
Ha: Alcohol & Nicotine are dependent

alcohol * nicotine Crosstabulation

			nicotine			
			none	1-15	16+	Total
alcohol	none	Count	105	7	11	123
		Expected Count	82.7	17.7	22.6	123.0
		% within alcohol	85.4%	5.7%	8.9%	100.0%
		% within nicotine	34.5%	10.8%	13.3%	27.2%
		% of Total	23.2%	1.5%	2.4%	27.2%
	0.01-0.10	Count	58	5	13	76
		Expected Count	51.1	10.9	14.0	76.0
		% within alcohol	76.3%	6.6%	17.1%	100.0%
		% within nicotine	19.1%	7.7%	15.7%	16.8%
		% of Total	12.8%	1.1%	2.9%	16.8%
	0.11-0.99	Count	84	37	42	163
		Expected Count	109.6	23.4	29.9	163.0
		% within alcohol	51.5%	22.7%	25.8%	100.0%
		% within nicotine	27.6%	56.9%	50.6%	36.1%
		% of Total	18.6%	8.2%	9.3%	36.1%
	1.00+	Count	57	16	17	90
		Expected Count	60.5	12.9	16.5	90.0
		% within alcohol	63.3%	17.8%	18.9%	100.0%
		% within nicotine	18.8%	24.6%	20.5%	19.9%
		% of Total	12.6%	3.5%	3.8%	19.9%
Total		Count	304	65	83	452
		Expected Count	304.0	65.0	83.0	452.0
		% within alcohol	67.3%	14.4%	18.4%	100.0%
		% within nicotine	100.0%	100.0%	100.0%	100.0%
		% of Total	67.3%	14.4%	18.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.252[a]	6	.000
Likelihood Ratio	44.653	6	.000
Linear-by-Linear Association	18.993	1	.000
N of Valid Cases	452		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.93.

χ^2 = 42.252, $p < 0.05$ therefore we reject the Ho and assume that nicotine use and alcohol use are dependent.