

Bus Adm 216: Solving a two variable problem using ch10 (condition 5) and ch12 (equality of proportion) approach. 

You have two vaccines: new and existing; You have two types of health conditions: Sick and healthy

If the new vaccine is effective then fewer people who got it would fall sick. We test it here using a two tail hypothesis. We show that the results from the Z test (ch10) two tail hypothesis are same as ch12 Chi square (one tail) hypothesis (note: Chi square is always upper tail test). Pay attention to how the hypothesis is worded in the problems below. It is same for both the scenarios – equal to for Ho and not equal to for Ha. It’s a proportion problem and involves two groups so you could use either ch10 (proportion problem condition 5) or ch12 (equality of proportions here).

Approach1: Solving the problem using ch10 – two group – proportion approach

vaccinetype	Condition	Freq
New	Sick	50.00
New	Healthy	2100.00
Existing	Sick	60.00
Existing	Healthy	2100.00

Solving the problem using Two group – proportion problem (condition 5 approach)

Ha: The proportion of people falling sick with new vaccine is not equal to the proportion of people falling sick with existing vaccine

Box1:
P bar 1:
50/2150=.0232
P bar 2: 60/2160 =
.0278

Box2:
Zstat=-.937

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Box3:
.1736 X 2 = .347

Box5:
Two tail critical value
Zalpha = + or -
1.96

Box 4:
Alpha = .05

Approach2: Solving the problem using ch12 – equal proportion approach (I solve it using note-sheet and also SPSS – the screen shots are shown below)

vaccinetype	Condition	Freq
New	Sick	50.00
New	Healthy	2100.00
Existing	Sick	60.00
Existing	Healthy	2100.00

Solving the problem using Chi square – Chapter 12 approach

Ha: The proportion of people falling sick with new vaccine is not equal to the proportion of people falling sick with existing vaccine

Box1:
Df=1

Box2:
Chisq Stat=.886

Box3: Between .1 and .9. It is .347 from Excel

	A	B	C
1	=CHISQ.DIST.RT(0.886,1)		
2	0.347		

Box5:
Chisq alpha = 3.841

Box 4:
Alpha = .05

Note sheet solution for the chi-square version of the problem

		vaccine type			
		New	Existing		
condition	Sick	50	60	110	
	Healthy	2100	2100	4200	
		2150	2160	4310	
F	E				
	50	54.872	-4.872	23.74018	0.4326435
	60	55.128	4.872	23.74018	0.4306405
	2100	2095.128	4.872	23.74018	0.0113311
	2100	2104.872	-4.872	23.74018	0.0112787
					0.886

SPSS soln for chi-square version of the problem

vaccinetype	Condition	Freq
New	Sick	50.00
New	Healthy	2100.00
Existing	Sick	60.00
Existing	Healthy	2100.00

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.886 ^a	1	.347		
Continuity Correction ^b	.713	1	.398		
Likelihood Ratio	.887	1	.346		
Fisher's Exact Test				.385	.199
Linear-by-Linear Association	.886	1	.347		
N of Valid Cases	4310				