

1. Costs are the initial test plus additional diagnostic tests if needed.

(a) First test correctly finds 800 cases (80% of the 1,000 with cancer) and incorrectly finds 10,000 cases (10% of the 100,000 tested).

Cost: $100,000 \times \$20 + (800 + 10,000) \times \$200 = \$4,160,000$.

Benefit: $800 \times \$20,000 = \$16,000,000$.

Yes. Test is worthwhile as (marginal) benefit of first test > (marginal) cost of first test.

(b) Now left with 200 cases of cancer to find.

The second test will find 160 cases (80% of 200)

and incorrectly find 9,000 new cases (10% of 100,000 – 10,000).

Cost: $100,000 \times \$5 + (160 + 9,000) \times \$200 = \$2,232,000$.

Benefit: $160 \times \$20,000 = \$3,200,000$.

Yes. Second test is worthwhile as marginal benefit of second test > MC of second test.

2.(a) CBA compares costs to benefits so gives the complete picture.

(b) CEA does not require attributing a benefit to the outcome, such as the value of a life.

(c) QALY's are a refinement of CEA that adjust life-years saved for the quality of the life. Different treatments lead to different quality of life after the treatment.

3.(a) With 1 team deaths fall from 1,200 to 500 so $1200 - 500 = 700$ are saved and so on

# of Teams	Total cost	Total lives saved	Average cost per life saved	Marginal cost	Marginal lives saved	Marginal cost per life saved
0	0	0	-	0	-	-
1	25,000	700	35.7	25,000	700	35.7
2	50,000	1,000	50	25,000	300	83.3
3	75,000	1,100	68.2	25,000	100	250
4	100,000	1,140	87.7	25,000	40	625
5	125,000	1,160	107.8	25,000	20	1250
6	150,000	1,170	128.2	25,000	10	2500
7	175,000	1,175	148.9	25,000	5	5000
8	200,000	1,178	169.8	25,000	3	8333
9	225,000	1,180	190.7	25,000	2	12500
10	250,000	1,180	211.9	25,000	0	∞

(b) See figure next page.

Optimal number of teams is 6:

with 6 teams: $MB = 4,000 > MC = 2,500$

but with 7 teams: $MB = 4,000 < MC = 5,000$.

(c) Optimal number of teams is now 8:

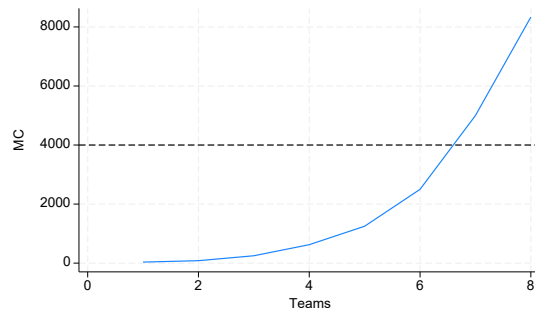
with 8 teams: $MB = 10,000 > MC = 8,333$

but with 9 teams: $MB = 10,000 < MC = 12,500$.

(d) This is the same as minimum \$ per life saved which is the initial 1 team.

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3.(a) Figure



4.(a) We obtain out of 1,314 observations

outpatient 0 missing and 165 zero
age 77 missing
bad_health 132 missing
fam_inc 86 missing and 11 zero.

(b) Straightforward.

(c) 203 extra observations were lost.

(d) sum gave 1,111 available observations (= 1,314 – 203) for all the variables.

5.(a) . regress outpatient i.plan, vce(robust)

Linear regression

Number of obs = 1,111
F(4, 1106) = 3.23
Prob > F = 0.0120
R-squared = 0.0109
Root MSE = 1517.8

outpatient	Coefficient	Robust std. err.	t	P> t	[95% conf. interval]	
plan						
25% Coins	-290.3625	115.1482	-2.52	0.012	-516.296	-64.42899
50% Coins	-253.586	161.8218	-1.57	0.117	-571.0983	63.9263
95%/100% Coins	-341.094	158.9935	-2.15	0.032	-653.0568	-29.13109
Indv Deduct	-395.627	117.8184	-3.36	0.001	-626.7998	-164.4541
_cons	1195.032	81.87775	14.60	0.000	1034.378	1355.685

(b) The 0% coinsurance plan was dropped.

(c) Spending on the 25% coinsurance plan was on average \$290.36 less than on 0% plan.

(d) Spending on the 95%/100% plan was on average $-341.09 - (-253.39) = \$87.70$ less than on the 50% coinsurance plan.

(e) Yes. Jointly statistically significant at level 0.05 since overall $F = 3.23$ with $p = 0.0120 < 0.05$.

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6.(a) regress outpatient i.plan age bad_health fam_inc, vce(robust)

Linear regression				Number of obs	=	1,111	
				F(7, 1103)	=	13.89	
				Prob > F	=	0.0000	
				R-squared	=	0.0731	
				Root MSE	=	1471.3	
	lnout	Coefficient	Robust std. err.	t	P> t	[95% conf. interval]	

plan							
25% Coins		-270.2919	110.9971	-2.44	0.015	-488.0812	-52.50259
50% Coins		-228.3895	157.741	-1.45	0.148	-537.8959	81.11691
95%/100% Coins		-381.1206	154.5496	-2.47	0.014	-684.365	-77.87614
Indv Deduct		-417.5986	115.9168	-3.60	0.000	-645.0408	-190.1563
age		21.32319	2.602984	8.19	0.000	16.21583	26.43055
bad_health		457.5962	240.1108	1.91	0.057	-13.52937	928.7217
fam_income		-.0003274	.0069477	-0.05	0.962	-.0139595	.0133048
cons		638.7933	118.5081	5.39	0.000	406.2665	871.3202

(b) Expect (1) more spending as age; (2) more spending with bad_health; and (3) more spending with income. Here (1) and (2) positive as expected. (3) negative is unexpected but low coefficient and insignificant.

(c) No. bad_health is statistically insignificant at level 0.05 ($p = 0.057 > 0.05$).

And fam_income is statistically insignificant at level 0.05 ($p = 0.962 > 0.05$).

(d) Yes. The three regressors are jointly statistically significant at level 0.05 since the separate F test on the three coefficients had $F = 28.60$ with $p = 0.000 < 0.05$.

(e) Yes. Not too much change. $(-290 \rightarrow -270; -253 \rightarrow -228; -341 \rightarrow -381; -395 \rightarrow -417)$.

(f) The coinsurance variables have very little correlation with age, bad_health and fam_inc. The highest correlation is 0.1054 of coins95 with fam_income.

7.(a) . regress lnout i.plan age bad_health fam_income, vce(robust)

Linear regression				Number of obs	=	1,111
				F(7, 1103)	=	19.74
				Prob > F	=	0.0000
				R-squared	=	0.0975
				Root MSE	=	2.2433
	lnout	Coefficient	Robust std. err.	t	P> t	[95% conf. interval]

plan						
25% Coins		-.77046	.1785214	-4.32	0.000	-1.12074 - .4201802
50% Coins		-.7982001	.2437622	-3.27	0.001	-1.27649 - .3199102
95%/100% Coins		-1.569352	.2098037	-7.48	0.000	-1.981012 -1.157693
Indv Deduct		-.9102364	.2006718	-4.54	0.000	-1.303978 - .5164948
age		.0218153	.0040686	5.36	0.000	.0138322 .0297983
bad_health		.4161576	.2756043	1.51	0.131	-.1246103 .9569255
fam_income		.0000555	.0000119	4.67	0.000	.0000322 .0000789
cons		5.029345	.1830486	27.48	0.000	4.670182 5.388507

(b) Spending on the 50% coinsurance plan is 79.8 percent less than on the free plan!

This is using the usual interpretation which works well for small changes.

Here we have a big change and better to use $100 \times \{\exp(-.798) - 1\} = 55.0$ percent less.

(c) A \$1 increase in family income is associated with a $100 \times 0.0000555 = 0.00555\%$ increase in spending.

So a \$1,000 increase in family income is associated with a 5.55% increase in spending.

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7.(d) . regress lnout i.plan age bad_health lnincome, vce(robust)

. regress lnout i.plan age bad_health lnincome, vce(robust)

Linear regression

Number of obs = 1,111
F(7, 1103) = 17.16
Prob > F = 0.0000
R-squared = 0.0876
Root MSE = 2.2555

lnout	Coefficient	Robust std. err.	t	P> t	[95% conf. interval]	
plan						
25% Coins	-.7869099	.1799008	-4.37	0.000	-1.139896	-.4339235
50% Coins	-.7719364	.2460723	-3.14	0.002	-1.254759	-.2891138
95%/100% Coins	-1.518629	.2106182	-7.21	0.000	-1.931887	-1.105371
Indv Deduct	-.9030009	.1986889	-4.54	0.000	-1.292852	-.51315
age	.0236904	.0040634	5.83	0.000	.0157175	.0316632
bad_health	.3219169	.2757062	1.17	0.243	-.219051	.8628847
lnincome	.1849625	.0784983	2.36	0.019	.0309398	.3389853
_cons	3.945924	.720103	5.48	0.000	2.532997	5.35885

(e) The income elasticity is 0.185. Normal good since elasticity > 0 .

(f) Age is a big determinant of outpatient spending with a large effect with one more year of age associated with a 2.37 percent increase in spending and is the most highly statistically significant. lnincome is also a big determinant.

8.(a) See notes.

(b) below

