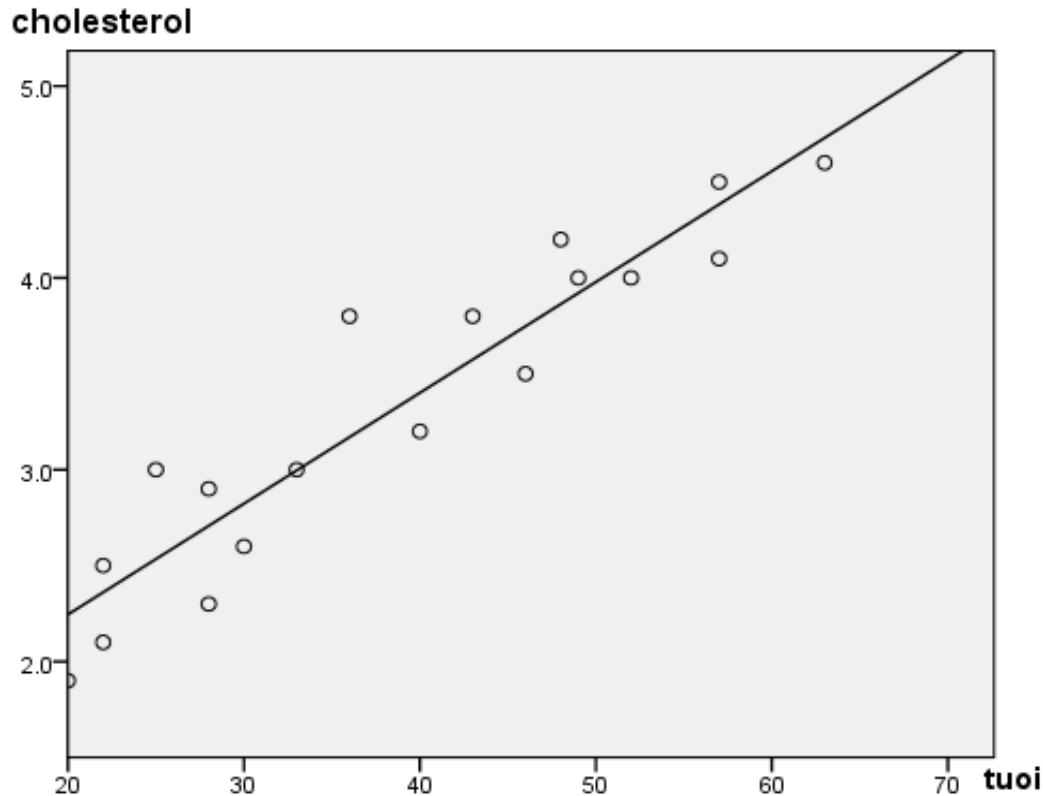


HỒI QUI LOGISTIC ĐƠN VÀ ĐA BIẾN

HỒI QUI TUYẾN TÍNH

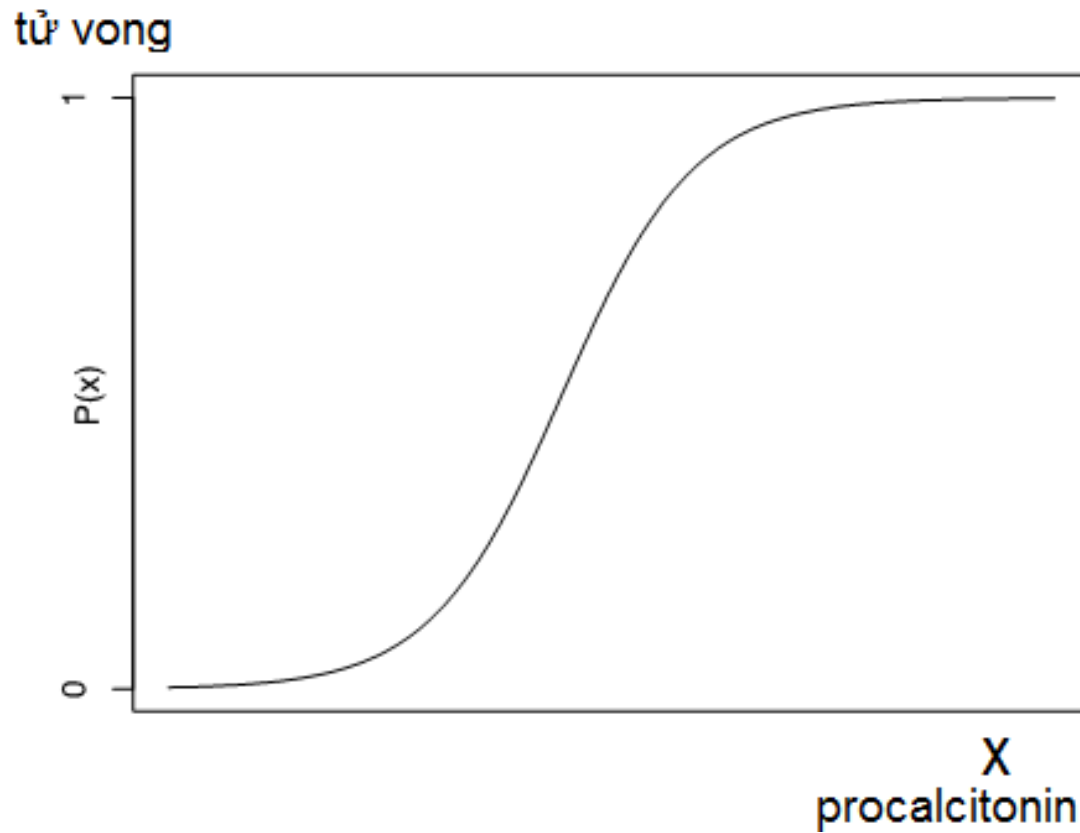


$$Y = \alpha + \beta X$$

X và Y đều là biến số liên tục

$$\text{Cholesterol} = 1,089 + 0,058 * \text{Tuổi}$$

HỒI QUI LOGISTIC



X là biến số (procalcitonin) Y là biến nhị phân (Chết/Sống)

MÔ HÌNH HỒI QUI LOGISTIC

- X là yếu tố dự đoán (nguy cơ)
- Y là xác suất (p) khi sự kiện xảy ra (kết cục) (biến số)
- Mô hình hồi qui logistic được định nghĩa:

$$\text{logit}(p) = a + bX$$

hoặc

$$\log \frac{p}{1-p} = a + bX$$

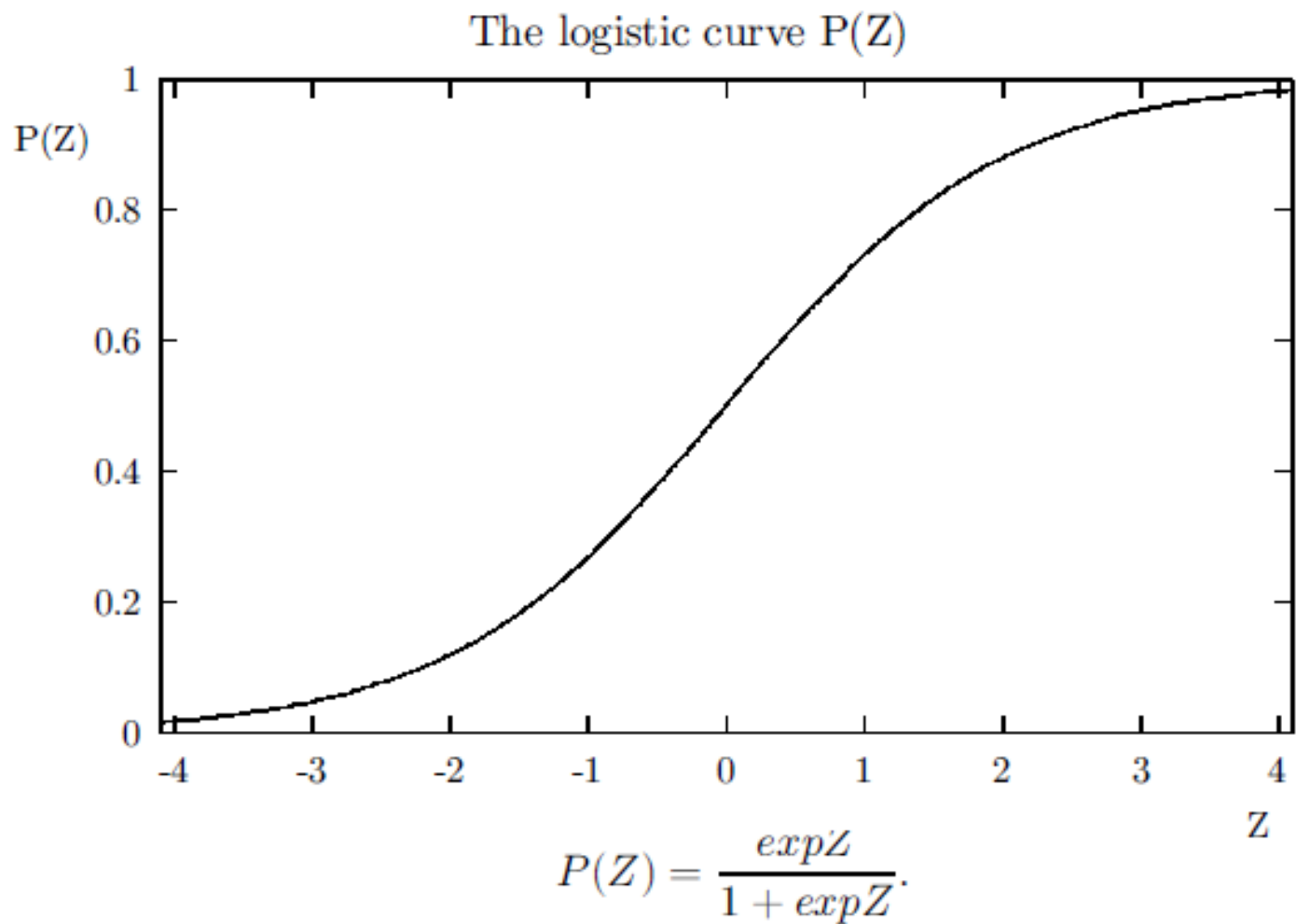
MÔ HÌNH HỒI QUI LOGISTIC

$$\log \frac{p}{1-p} = a + bX$$

Có nghĩa:

$$p = \frac{e^{a+bX}}{1 + e^{a+bX}}$$

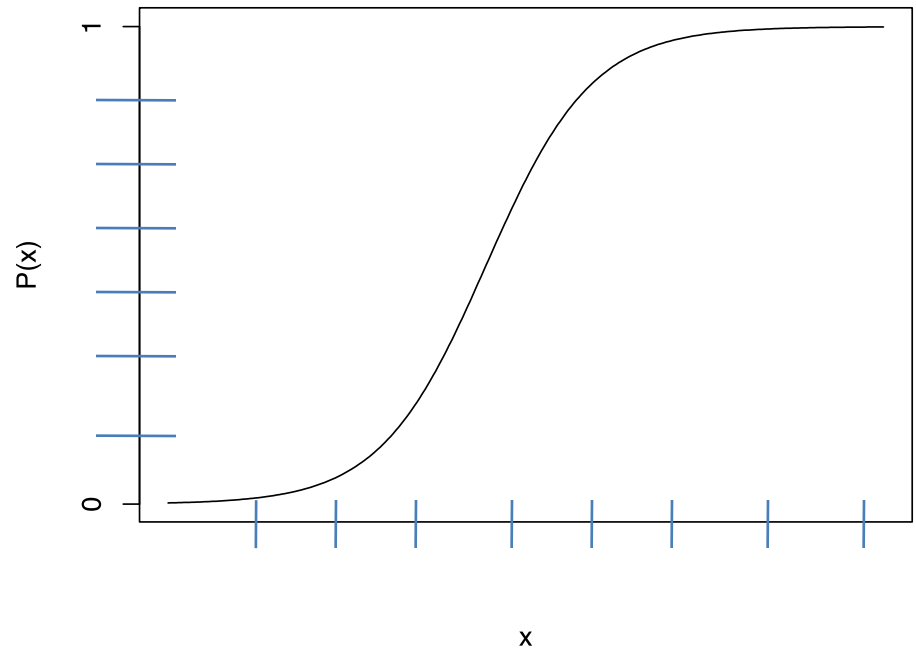
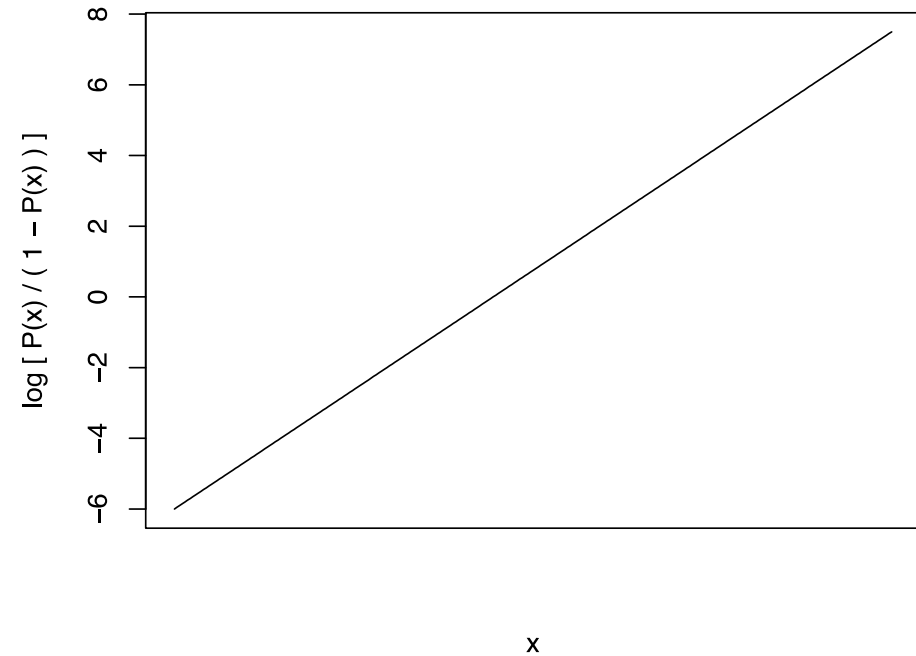
HỒI QUI LOGISTIC



Liên hệ giữa X, p và logit (p)

$$\log \frac{p}{1-p} = a + bX$$

$$p = \frac{e^{a+bX}}{1 + e^{a+bX}}$$



HỒI QUI LOGISTIC ĐƠN BIẾN

*Untitled2 [DataSet2] - SPSS Data Editor

	ID	PROCALCITONIN	DEATH
1	1	0.10	0
2	2	0.20	0
3	3	0.00	0
4	4	0.40	0
5	5	0.50	0
6	6	0.10	0
7	7	0.30	1
8	8	0.20	0
9	9	0.60	0
10	10	0.70	1
11	11	0.70	1
12	12	0.80	1
13	13	0.90	1
14	14	0.90	1
15	15	1.00	0
16	16	1.30	1
17	17	1.10	1
18	18	1.50	1
19	19	1.70	1
20	20	1.90	1

HỒI QUI LOGISTIC ĐƠN BIẾN

procalcitonin death 2.sav [DataSet2] - SPSS Data Editor

File Edit View Data Transform **Analyze** Graphs Utilities Add-ons Window Help

1 : ID 1

	ID	PROCALC
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	
10	10	
11	11	
12	12	
13	13	
14	14	
15	15	
16	16	
17	17	
18	18	
19	19	

Reports

Descriptive Statistics

Tables

Compare Means

General Linear Model

Generalized Linear Models

Mixed Models

Correlate

Regression

Loglinear

Neural Networks

Classify

Data Reduction

Scale

Nonparametric Tests

Time Series

Survival

Missing Value Analysis...

Multiple Response

Complex Samples

R **LIN** Linear...

R **PLS** Curve Estimation...

R **PLS** Partial Least Squares...

R **LOG** Binary Logistic...

R **MULT** Multinomial Logistic...

R **ORD** Ordinal...

R **PROB** Probit...

R **NLR** Nonlinear...

R **WLS** Weight Estimation...

R **ZSLS** 2-Stage Least Squares...

Optimal Scaling...

HỒI QUI LOGISTIC

Logistic Regression

Dependent: DEATH

Block 1 of 1

Covariates: PROCALCITONIN

Method: Enter

Selection Variable:

OK Paste Reset Cancel Help

Previous Next

Categorical... Save... Options...

ID PROCALCITONIN

Logistic Regression: Save

Predicted Values

- ☒ Probabilities
- ☐ Group membership

Influence

- ☐ Cook's
- ☐ Leverage values
- ☐ DfBeta(s)

Residuals

- ☐ Unstandardized
- ☐ Logit
- ☐ Studentized
- ☐ Standardized
- ☐ Deviance

Export model information to XML file

Browse

☐ Include the covariance matrix

Continue Cancel Help

HỒI QUI LOGISTIC ĐƠN BIẾN

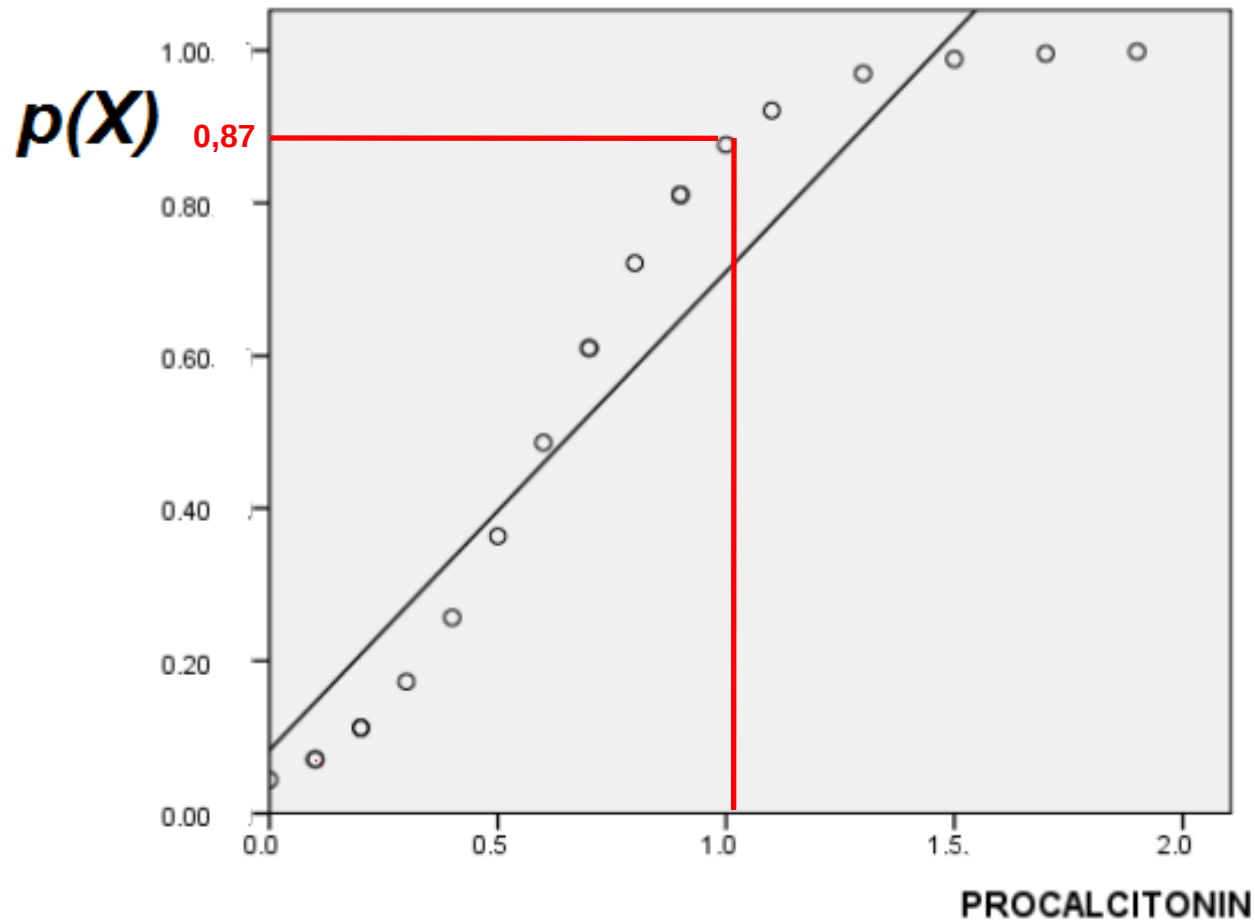
*procalcitonin death 2.sav [DataSet2] - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Windows

1 : ID 1

	ID	PROCALCITONIN	DEATH	PRE_1
1	1	0.10	0	0.07074
2	2	0.20	0	0.11187
3	3	0.00	0	0.04398
4	4	0.40	0	0.25647
5	5	0.50	0	0.36339
6	6	0.10	0	0.07074
7	7	0.30	1	0.17249
8	8	0.20	0	0.11187
9	9	0.60	0	0.48575
10	10	0.70	1	0.60985
11	11	0.70	1	0.60985
12	12	0.80	1	0.72119
13	13	0.90	1	0.81062
14	14	0.90	1	0.81062
15	15	1.00	0	0.87629
16	16	1.30	1	0.96979
17	17	1.10	1	0.92139
18	18	1.50	1	0.98875
19	19	1.70	1	0.99586
20	20	1.90	1	0.99849

XÁC SUẤT TỬ VONG P THEO NĐ PROCALCITONIN



HỒI QUI LOGISTIC ĐƠN BIẾN

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	PROCALCITONIN	5.037	2.186	5.307	1	.021	153.988	2.120	1.118E4
	Constant	-3.079	1.480	4.327	1	.038	.046		

a. Variable(s) entered on step 1: PROCALCITONIN.

$$\text{Log} \left(\frac{p}{1-p} \right) = -3,079 + 5.037 * \text{procalcitonin}$$

$$\left(\frac{p}{1-p} \right) = e^{-3,079 + 5,037 \cdot \text{procalcitonin}}$$

$$\text{Odd} = e^{-3,079 + 5,037 \cdot \text{procalcitonin}}$$

$$\frac{\text{Odd}_1}{\text{Odd}_0} = \frac{e^{-3,079 + 5,037}}{e^{-3,079}} = e^{5,037} = 153,98$$

HỒI QUI LOGISTIC ĐA BIẾN

hoi qui logistic 30.sav [DataSet4] - SPSS Data Editor

	ID	AGE	HYPOTENSION	PROCALCITONIN	DEATH
1	1	70	1	0.70	1
2	2	80	1	0.40	1
3	3	50	1	0.70	1
4	4	55	1	0.80	1
5	5	60	1	0.90	1
6	6	65	1	1.00	1
7	7	70	1	0.50	1
8	8	75	1	0.70	1
9	9	80	1	1.20	1
10	10	50	1	0.80	1
11	11	70	1	1.10	1
12	12	45	1	0.60	1
13	13	60	1	1.30	1
14	14	90	1	3.30	1
15	15	40	0	0.20	1
16	16	60	1	0.70	0
17	17	60	0	0.50	0

HỒI QUI LOGISTIC ĐA BIẾN

 Logistic Regression ✕

 ID
 AGE
 HYPOTENSION
 PROCALCITONIN

Dependent:  DEATH

Block 1 of 1

 Previous  Next

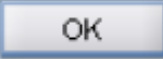
Covariates:

 PROCALCITONIN
AGE
HYPOTENSION(Cat)

 >a*b>

Method: Enter ▾

Selection Variable:   Rule...

 OK  Paste  Reset  Cancel  Help

 Categorical...
 Save...
 Options...

HỒI QUI LOGISTIC ĐA BIẾN

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	PROCALCITONIN	.137	1.875	.005	1	.942	1.147	.029	45.204
	AGE	.013	.058	.049	1	.825	1.013	.904	1.135
	HYPOTENSION(1)	4.915	1.968	6.240	1	.012	136.326	2.882	6447.900
	Constant	-3.232	2.634	1.506	1	.220	.039		

a. Variable(s) entered on step 1: PROCALCITONIN, AGE, HYPOTENSION.

$$\text{Log} \left(\frac{p}{1-p} \right) = -3,232 + 0,137 \cdot \text{PROCALCITONIN} + 0,013 \cdot \text{AGE} + 4,915 \cdot \text{HYPOTENSION}$$

Tóm tắt kết quả trong bảng sau:

Yếu tố	Odds ratio (OR)	Khoảng tin cậy 95%	Giá trị p
Procalcitonin	1,14	0,03 - 45,20	0,94
Tuổi	1,01	0,90 - 1,13	0,82
Hạ huyết áp	136	3 – 6447	0,01

BÀI TẬP: SANH NON

A	B	C	D	E	F	G	H	I	J	K
SVV	TuoiMe	Thuocla	Laodong	Hocvan	Benhtat	ThuNhap	Socon	KhamThai	TuoiThai	Sanhnon
13196	24	1	1	0	0	2	0	0	35	1
13718	34	1	0	1	0	2	0	1	39	0
23271	17	1	1	0	0	2	0	0	36	1
16830	28	1	0	0	0	2	1	2	36	1
1723	25	0	1	0	0	2	0	1	36	1
6470	26	0	0	1	0	2	0	2	33	1
16878	28	1	1	0	0	2	0	1	37	0
5191	28	0	0	1	0	2	0	1	38	0
16714	19	1	1	0	0	1	0	0	37	0
3697	20	1	1	0	0	1	0	0	37	0
13819	28	0	0	1	0	2	0	1	37	0
4794	23	1	1	0	0	2	0	2	27	1
5275	18	1	0	0	0	2	0	2	32	1
16154	27	0	1	1	0	2	0	2	37	0
10435	27	1	0	0	0	2	0	1	39	0
14247	24	0	1	1	0	2	0	2	40	0
6748	34	1	1	0	0	2	1	2	33	1
13681	25	1	1	0	0	1	0	1	40	0
15163	23	0	1	0	0	2	0	2	37	0
21929	18	1	1	0	0	1	0	1	39	0
16969	22	1	1	0	0	2	0	1	33	1
10869	28	0	0	1	0	2	0	2	39	0
13471	26	1	0	0	0	2	1	1	37	0
5533	21	1	0	0	0	2	0	0	34	1
18035	21	0	0	0	0	2	0	2	37	0
19522	23	0	0	0	0	2	0	2	39	0
9155	22	1	0	0	0	2	0	0	37	0
19865	20	1	0	0	0	2	0	1	36	1

HỒ QUI LOGISTIC ĐA BIẾN

*Untitled2 [DataSet1] - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

1: SVV 13196

	SVV	TuoiMe	Thuocla	Laodong	Hocvan	Benhtat	ThuNhap	Socon	KhamThai	TuoiThai	Sanhnon
1	13196	24	1	1	0	0	2	0	0	35	1
2	13718	34	1	0	1	0	2	0	1	39	0
3	23271	17	1	1	0	0	2	0	0	36	1
4	16830	28	1	0	0	0	2	1	2	36	1
5	1723	25	0	1	0	0	2	0	1	36	1
6	6470	26	0	0	1	0	2	0	2	33	1
7	16878	28	1	1	0	0	2	0	1	37	0
8	5191	28	0	0	1	0	2	0	1	38	0
9	16714	19	1	1	0	0	1	0	0	37	0
10	3697	20	1	1	0	0	1	0	0	37	0
11	13819	28	0	0	1	0	2	0	1	37	0
12	4794	23	1	1	0	0	2	0	2	27	1
13	5275	18	1	0	0	0	2	0	2	32	1
14	16154	27	0	1	1	0	2	0	2	37	0
15	10435	27	1	0	0	0	2	0	1	39	0
16	14247	24	0	1	1	0	2	0	2	40	0
17	6748	34	1	1	0	0	2	1	2	33	1
18	13681	25	1	1	0	0	1	0	1	40	0
19	15163	23	0	1	0	0	2	0	2	37	0
20	21929	18	1	1	0	0	1	0	1	39	0
21	16969	22	1	1	0	0	2	0	1	33	1
22	10869	28	0	0	1	0	2	0	2	39	0
23	13471	26	1	0	0	0	2	1	1	37	0
24	5533	21	1	0	0	0	2	0	0	34	1
25	18035	21	0	0	0	0	2	0	2	37	0
26	19522	23	0	0	0	0	2	0	2	39	0
27	9155	22	1	0	0	0	2	0	0	37	0
28	19865	20	1	0	0	0	2	0	1	36	1
29	6530	30	1	0	0	0	2	1	2	40	0
30	2365	23	1	1	0	0	2	0	2	39	0
31	16740	33	1	1	1	0	2	2	1	32	1

LIÊN HỆ GIỮA THUỐC LÁ-SANH NON

Thuocla * Sanhnon Crosstabulation

			Sanhnon		Total
			0	1	
Thuocla	0	Count	46	14	60
		% within Thuocla	76.7%	23.3%	100.0%
	1	Count	59	88	147
		% within Thuocla	40.1%	59.9%	100.0%
Total		Count	105	102	207
		% within Thuocla	50.7%	49.3%	100.0%

Chi-Square Tests

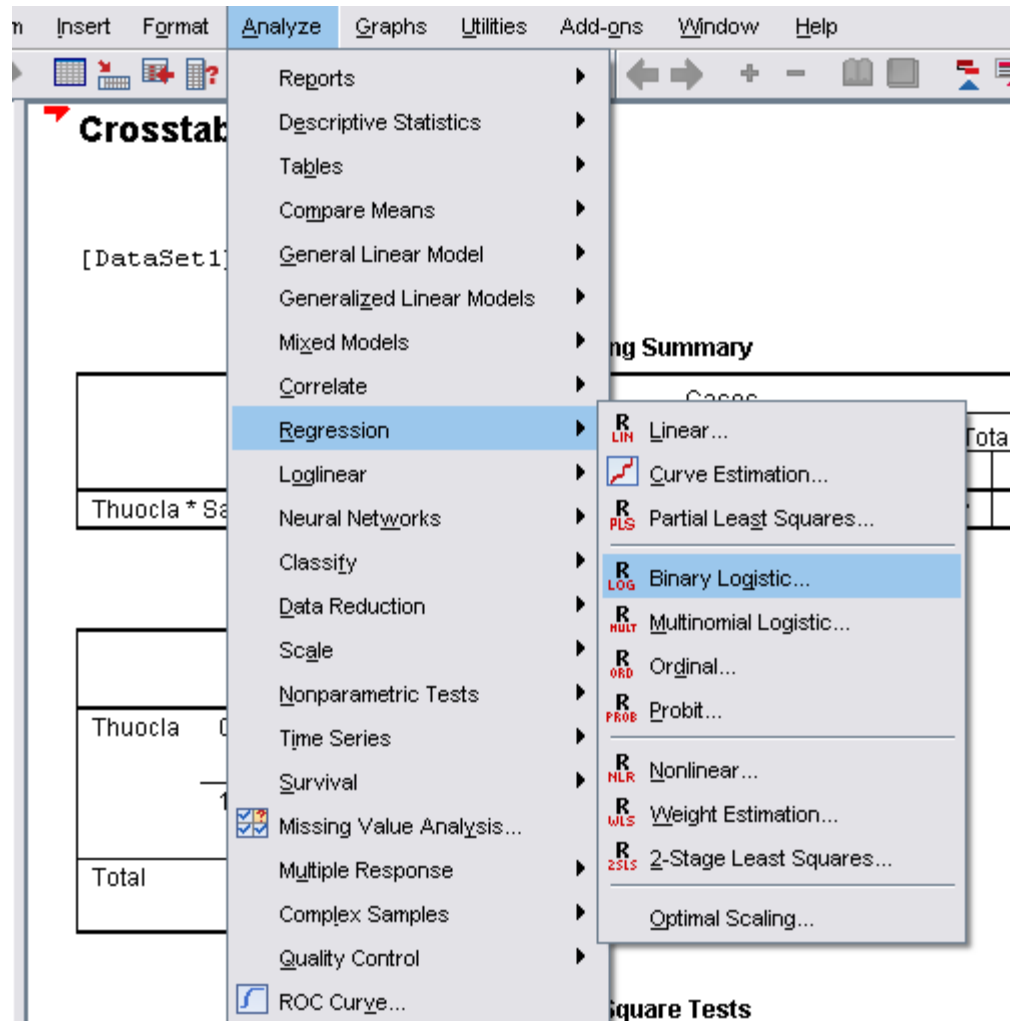
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	22.749 ^a	1	.000	.000	.000
Continuity Correction ^b	21.311	1	.000		
Likelihood Ratio	23.700	1	.000		
Fisher's Exact Test					
Linear-by-Linear Association	22.639	1	.000		
N of Valid Cases ^a	207				

Risk Estimate

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for Thuocla (0 / 1)	4.901	2.475	9.704
For cohort Sanhnon = 0	1.910	1.500	2.433
For cohort Sanhnon = 1	.390	.242	.628
N of Valid Cases	207		

OR= 4,9 (KTC 95%: 2,4-9,7) (p=0,000)

HỒI QUI LOGISTIC



HỒI QUI LOGISTIC

 Logistic Regression ✕

 SVV
 Tuoime
 Thuocla
 Laodong
 Hocvan
 Benhtat
 ThuNhap
 Socon
 KhamThai
 Tuoithai
 Predicted probability [PR...]
 Leverage value [LEV_1]
 Normalized residual [ZR...]

Dependent:  Sanhnon

Block 1 of 1

Previous Next

Covariates:
Thuocla
Tuoime
Laodong
Hocvan
Benhtat

Method: Enter

Selection Variable: Rule...

OK Paste Reset Cancel Help

Categorical...
Save...
Options...

HỒI QUI LOGISTIC

Variables in the Equation

								95.0% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1 ^a	Thuocla	1.506	.376	16.008	1	.000	4.508	2.156	9.427
	TuoiMe	-.064	.036	3.239	1	.072	.938	.874	1.006
	Laodong	.270	.329	.672	1	.412	1.309	.687	2.494
	Hocvan	.412	.365	1.276	1	.259	1.510	.739	3.089
	Benhtat	.406	.875	.216	1	.642	1.501	.270	8.345
	ThuNhap	1.213	.545	4.953	1	.026	3.365	1.156	9.795
	Socon	.619	.228	7.407	1	.006	1.857	1.189	2.901
	KhamThai	-.571	.177	10.426	1	.001	.565	.400	.799
	Constant	-1.209	1.208	1.002	1	.317	.298		

a. Variable(s) entered on step 1: Thuocla, TuoiMe, Laodong, Hocvan, Benhtat, ThuNhap, Socon, KhamThai.

Sau khi hiệu chỉnh các yếu tố gây nhiễu, cha hút thuốc lá là yếu tố độc lập gây sanh non ở trẻ sơ sinh với OR=4,5 (KTC 95%: 2,1-9,4; p=0.000)