

가

. Agresti(1990)

가

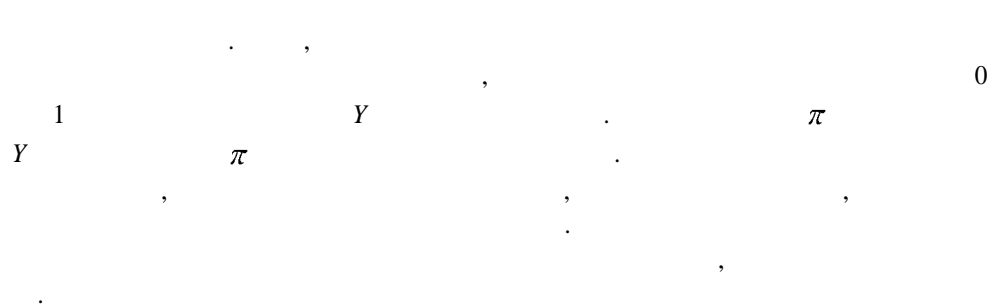
. Hosmer and Lemeshow(2000)

가

. Cox and Snell(1989)

가

2.



$$g(\pi(x)) = g(E(Y)) = \alpha + \beta'x \tag{2.1}$$

, g (link function) x , β
 g 가 logit

가 가

$$\log\left(\frac{\pi(x)}{1 - \pi(x)}\right) = \alpha + \beta'x \tag{2.2}$$

가 .
 가 2 3 ,
 < 2.1> . < 2.1>

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< 2.1: >

1	1	1	y_{111}	$n_{111} - y_{111}$
		2	y_{112}	$n_{112} - y_{112}$
		3	y_{113}	$n_{113} - y_{113}$
	2	1	y_{121}	$n_{121} - y_{121}$
		2	y_{122}	$n_{122} - y_{122}$
		3	y_{123}	$n_{123} - y_{123}$
⋮	⋮	⋮	⋮	⋮
3	1	1	y_{311}	$n_{311} - y_{311}$
		2	y_{312}	$n_{312} - y_{312}$
		3	y_{313}	$n_{313} - y_{313}$
	2	1	y_{321}	$n_{321} - y_{321}$
		2	y_{322}	$n_{322} - y_{322}$
		3	y_{323}	$n_{323} - y_{323}$

3.

가 ,

i (, $i = 1, 2, \dots, a$), j (, $j = 1, 2, \dots, b$), k (, $k = 1, 2, \dots, c$) .
 x , 가

$$\log it(\pi_{ijk}) = \alpha + \beta'x + a_i + b_{j(i)} + c_{k(ij)} \quad (3.1)$$

· , a_i i , $b_{j(i)}$ i j .
 $c_{k(ij)}$ i , j k .
 $N(0, \sigma_a^2)$, $N(0, \sigma_b^2)$, $N(0, \sigma_c^2)$
 가 .
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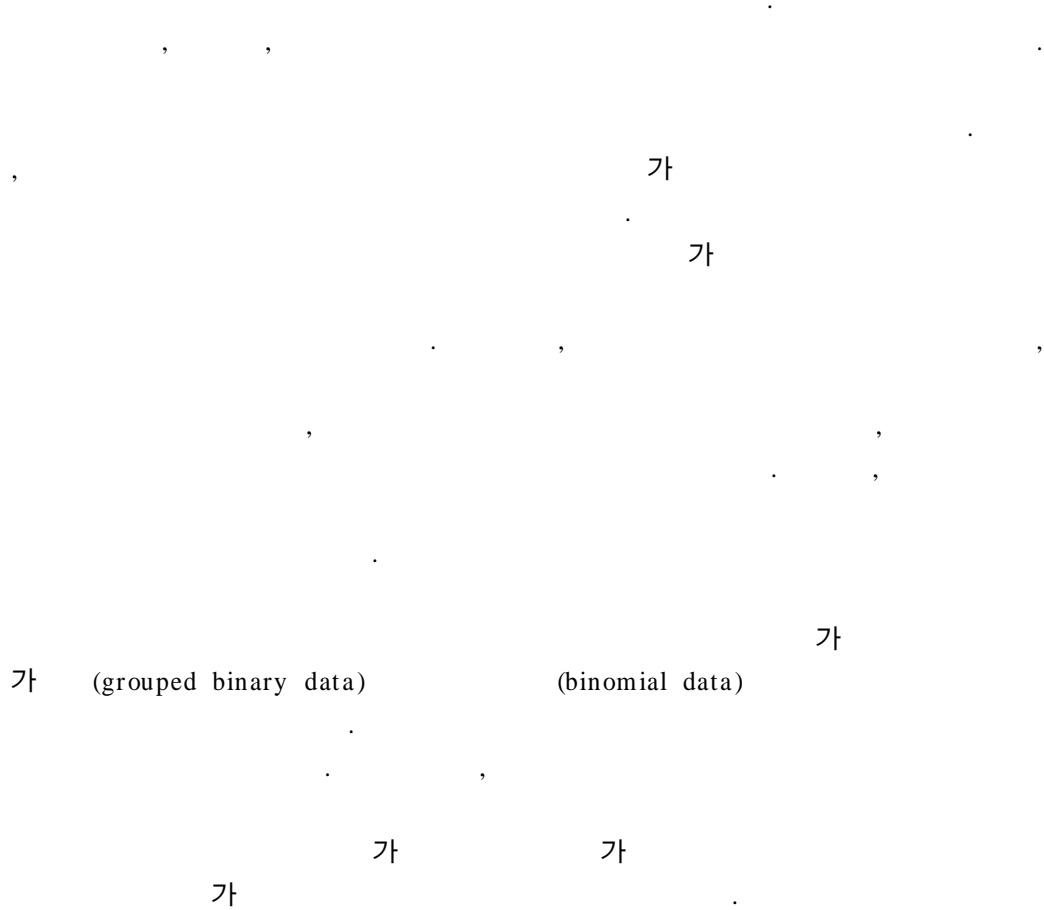
가 ,

$$\log it(\pi_{ijk}) = \alpha + \beta'x + \gamma'z + a_i + b_{(ij)} \quad (3.2)$$

· , $z = (z_1, z_2, \dots, z_{(c_{ij}) - 1})'$ i , j 가 $c_{(ij)}$
 , $(c_{(ij)} - 1)$ 가 .

· , 가 . ,
 . π
 n , π
 , π , ,
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4.



4 9 .

1 3 가

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1 2

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< 4.1> 2

$$\log \pi_{ij} = \mu + \alpha_i + \beta_{j(i)} \tag{4.1}$$

, μ α_i i $\beta_{j(i)}$ i j

< 4.1: 2001 >

		50	50	4	15	12	14.92
		40	40	2	8	5	7.75
		60	50	8	25	21	21.90
		40	11	1	7	5	2.22
		40	40	2	8	7	7.75
		40	40	4	7	4	5.09
		50	45	6	14	11	9.23
	가	40	36	5	5	5	3.06
		40	6	2	2	1	0.58
		40	40	3	6	4	5.31
		40	31	2	25	23	21.72
		40	40	5	15	12	10.46

(4.1) 가 13 가 13 (saturated model) $\beta_{j(i)}$

$$\log it(\pi_{ij}) = \mu + \alpha_i + \beta_i x_{1j(i)} + \gamma_i x_{2j(i)} \tag{4.2}$$

, β_i i x_1 , γ_i x_2 . x_1 , x_2 . $\beta_{j(i)}$

$$\log it(\pi_{ij}) = \mu + \alpha_i + \beta_1 x_{1j(i)} + \beta_2 x_{2j(i)} \tag{4.3}$$

, β_1 β_2

(4.3)

$\hat{\mu} = -2.19(0.3196)$, $\hat{\alpha}_1 = 0.16(0.2865)$, $\hat{\beta}_1 = -0.17(0.0727)$ $\hat{\beta}_2 = 0.13(0.0210)$
 p-value 0.5745, p-value 0.3695, p-value 0, p-value 0

$$\log \text{it}(\pi_{ij}) = \mu + \beta_1 x_{1j(i)} + \beta_2 x_{2j(i)} \quad (4.4)$$

(4.4)

$\hat{\mu} = -2.13(0.2983)$, $\hat{\beta}_1 = -0.18(0.0666)$ $\hat{\beta}_2 = 0.13(0.0200)$
 p-value 0.01, p-value 0.4376, p-value 0.01, p-value 0.01
 (4.4) (4.4) (4.4) (4.4) < 4.1 >

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1. Agresti, Alan. (1990). *Categorical data analysis*, John Wiley and Sons, Inc., New York.
2. Cox, D.R.. and Snell, E.J. (1989). *Analysis of binary data* (2nd edition), Chapman and Hall, London.
3. Hosmer, W. David, and Lemeshow, Stanley. (2000). *Applied logistic regression* (2nd edition), John Wiley and Sons, Inc., New York.

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