

Method

Link function

Categorical predictor coding

Rows used

Logit

(1, 0)

100

Response Information

Variable	Value	Count
Purchase	1	42 (Event)
	0	58
Total		100

Regression Equation

$$P(1) = \exp(Y^*) / (1 + \exp(Y^*))$$

ViewAd	CollegeEdu		
No	No	$Y^* =$	$-7.788 + 0.1088 \text{ Income} + 1.547 \text{ No. Children}$
No	Yes	$Y^* =$	$-8.127 + 0.1088 \text{ Income} + 1.547 \text{ No. Children}$
Yes	No	$Y^* =$	$-5.108 + 0.1088 \text{ Income} + 1.547 \text{ No. Children}$
Yes	Yes	$Y^* =$	$-5.447 + 0.1088 \text{ Income} + 1.547 \text{ No. Children}$

Coefficients

Term	Coef	SE Coef	Z-Value	P-Value	VIF
Constant	-7.79	1.90	-4.09	0.000	
Income	0.1088	0.0323	3.37	0.001	1.35
No. Children	1.547	0.388	3.99	0.000	1.47
ViewAd					
Yes	2.680	0.637	4.20	0.000	1.53
CollegeEdu					
Yes	-0.339	0.574	-0.59	0.554	1.03

Odds Ratios for Continuous Predictors

	Odds Ratio	95% CI
Income	1.1149	(1.0465, 1.1878)
No. Children	4.6986	(2.1954, 10.0563)

Odds Ratios for Categorical Predictors

Level A	Level B	Odds Ratio	95% CI
ViewAd			
Yes	No	14.5853	(4.1818, 50.8706)
CollegeEdu			
Yes	No	0.7122	(0.2312, 2.1939)

Model Summary

Deviance	Deviance				Area Under
R-Sq	R-Sq(adj)	AIC	AICc	BIC	ROC Curve
31.52%	28.58%	103.18	103.82	116.20	0.8543

A marketing consultant for a cereal company is investigating the effectiveness of a TV advertisement for a breakfast cereal. The consultant shows the advertisement in a specific community for one month. Then, she randomly samples 100 shoppers as they leave a local supermarket to ask whether they viewed the Ad (Yes or No), whether they had at least a college degree (Yes or No), and whether they purchased the new cereal (1 if purchased, 0 otherwise). The consultant also asks the subjects about their annual household Income (\$1000) and number of children. Data is recorded in Minitab (partially shown below) and a binary logistic regression is fit.

↓	C1	C2	C3	C4-T	C5-T
	Purchase	Income	No. Children	ViewAd	CollegeEdu
1	0	22.5576	2	Yes	Yes
2	0	39.4748	0	No	Yes
3	1	40.1053	2	Yes	Yes
4	1	58.8789	1	No	No
5	0	32.9780	2	Yes	No
6	0	55.5124	1	No	No
7	0	45.6061	1	No	No
8	0	60.2521	1	No	Yes

Binary Logistic Regression: Purchase versus Income, No. Children, ViewAd, CollegeEdu

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- A. All 100 shoppers purchased the new cereal.
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3. Write down the prediction equations for predicting the probability of the event.

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A. All 100 shoppers purchased the new cereal.

B. All 100 shoppers did not purchase the new cereal
2. Define the event of interest in this case. Also, describe the odds of the event.
3. Write down the prediction equations for predicting the probability of the event.
4. Based on this model, for a shopper who has an income of \$55,000, no children and a college degree, and who saw the ad, the predicted probability that he/she will buy the cereal is:

A. 0.631

B. 0.537

C. 0.989

D. 0.716

E. 0.335

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4. Based on this model, for a shopper who has an income of \$55,000, no children and a college degree, and who saw the ad, the predicted probability that he/she will buy the cereal is:
A. 0.631
B. 0.537
C. 0.989
D. 0.716
E. 0.335
5. Controlling for Income, No. Children and CollegeEdu, which of the following is correct?
A. For a person who viewed the ad, the predicted probability they will buy the cereal increases by a factor of 2.682.
B. For a person who viewed the ad, the predicted odds they will buy the cereal increase by a factor of 2.682.
C. For a person who viewed the ad, the predicted odds they will buy the cereal increase by a factor of exp(2.682) ≈ 14.5853.
D. For a person who viewed the ad, the predicted probability they will buy the cereal increases by a factor of exp(2.682) ≈ 14.5853.

Binary Logistic Regression: Purchase versus Income, No. Children, ViewAd, CollegeEdu

Method

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6. At the 5% level, which of the predictors in this model individually has/have a significant effect on the probability of purchasing the cereal?
- A. All predictors.
 - B. Only No. Children and ViewAd.
 - C. No predictor is significant.
 - D. All predictors except CollegeEdu.
 - E. Cannot be determined based on the output.

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C. No predictor is significant.

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E. Cannot be determined based on the output.
7. If the odds of an event are 8 to 1 for the event, what is the probability of the event?
- A. 0.900

B. 0.909

C. 0.889

D. 0.125

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A. 0.900
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8. Controlling for ViewAd, No. Children, and CollegeEdu, which of the following is correct?

A. The probability of purchasing the cereal is predicted to increase by 0.1088 per unit increase in Income.
B. The odds of purchasing the cereal is predicted to increase by 0.1088 per unit increase in Income.
C. The odds of purchasing the cereal is predicted to decrease by a factor of exp(0.1088) per unit increase in Income. |
D. The probability of purchasing the cereal is predicted to increase by a factor of exp(0.1088) per unit increase in Income.
E. The natural log of the odds of purchasing the cereal is predicted to increase by 0.1088 per unit increase in Income.

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E. The natural log of the odds of purchasing the cereal is predicted to increase by 0.1088 per unit increase in Income.
9. Between the random prediction (in Problem 1) and prediction with logistic regression, which is expected to perform better in terms of the prediction accuracy? Why?