WMS 701 CAT

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(1) The data surg.csv shows results of a study about whether a patient having surgery with general anesthesia experienced a sore throat on waking (1 = yes,0 = no) as a function of duration of the surgery (in minutes) and type of device used to secure the airway (0 = laryngeal mask airway, 1 = tracheal tube). Fit a logistic model using these predictors and interpret parameter estimates

Description of Data

Soar throat by Type of Equipment used

Effect of Duration of surgery and type of Equipment used

$ln(odds\ of\ y) = \beta_0 + \beta_1 duration + \beta_2 type$

Term	Estimate	Std.Error	Statistic	P.value	Odds Ratio	Lower	Upper
Intercept	-1.2009	0.9100	-1.3197	0.1869	0.3009	0.0506	1.7907
Duration	0.0382	0.0183	2.0842	0.0371	1.0390	1.0023	1.0770
Tracheal tube	-0.4608	0.7424	-0.6206	0.5348	0.6308	0.1472	2.7031

Interpretation: After adjusting for the type of device used to secure the airway, a patient is approximately 4% more likely to experience a sore throat on waking, with every additional minute in duration of surgery.

(2) The ICU data set icudata.csv consists of a sample of 200 subjects who were part of a much larger study on survival of patients following admission to an adult intensive care unit (ICU). The major goal of this study was to develop a regression model to predict the probability of survival to hospital discharge of these patients and to study the risk factors associated with ICU mortality.

We fit the logistic regression below:

$ln(Odds\ of\ dying) = \beta_0 + \beta_1 age + \beta_2 gender + \beta_3 race + \beta_4 typeservice + \beta_5 infection + \beta_6 SBP + \beta_7 consciousness$

Term	Estimate	Std.Error	Statistic	P.value	Odds Ratio	Lower	Upper
Intercept	-1.4981	1.4089	-1.0633	0.2876	0.2235	0.0141	3.5373
Age	0.0279	0.0131	2.1370	0.0326	1.0283	1.0023	1.0550
Gender	-0.0889	0.4380	-0.2031	0.8391	0.9149	0.3877	2.1587
RACE	-0.0834	0.5169	-0.1614	0.8718	0.9199	0.3340	2.5337
Type of service	-0.9118	0.4469	-2.0402	0.0413	0.4018	0.1673	0.9648
Infection Probable	0.3294	0.4535	0.7265	0.4676	1.3902	0.5716	3.3811
Systolic Blood Pressure	-0.0122	0.0067	-1.8140	0.0697	0.9879	0.9750	1.0010
Level of Consciousness	3.7112	0.8716	4.2578	0.0000	40.9015	7.4098	225.7729

From the fitted model above, the only significant risk factors in predicting the probability of survival to hospital discharge are age, type of service and level of consciousness. We shall refit the model with only these risk factor.

Term	Estimate	Std.Error	Statistic	P.value	Odds Ratio	Lower	Upper
Intercept	-3.1159	0.8360	-3.7272	0.0002	0.0443	0.0086	0.2282
Age	0.0301	0.0126	2.3864	0.0170	1.0306	1.0054	1.0563
Type of service	-1.0502	0.4291	-2.4474	0.0144	0.3499	0.1509	0.8113
Level of Consciousness	3.6411	0.8188	4.4467	0.0000	38.1333	7.6614	189.8022

After adjusting for type of service and level of consciousness, the likelihood of an ICU patient surviving to discharge increases by 96% with every additional age.

(3) The data mental.csv comes from a study of mental health for a random sample of adult residents of Alachua County, Florida. Mental impairment is ordinal, with categories (well, mild symptom formation, moderate symptom formation, impaired). The study related mental impairment to two predictor variables: socioeconomic status (ses)(1=high, 0=low) and the life events index (event) which is a composite measure of the number and severity of important life events such as birth of child, new job, divorce, or death

in family that occurred to the subject within the past three years. Fit an ordinal (proportional odds) logistic regression model and interpret the results.