Project 2 Final

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Advanced Data Analysis

Introduction

- Question of Interest:
  • Do any of the VA hospitals in our dataset have death rates for heart surgery patients that are significantly higher or lower than expected?
- Data
  • We have data simulated to represent information on heart surgery from 44 VA hospitals in six-month time periods from the past 3 years
  • We want to look at expectation for the latest six-month period, but we can use all of the data to do so

Methods

- Approach
  - Make sure data is cleaned: convert weight to correct units
  - Fit a logistic regression model, to calculate predicted probabilities of death given asa, procedure, and BMI
  - Decide whether or not albumin should be included in the model
  - Average predicted probabilities over hospital to get expected death rate per hospital, compare this to observed rate at latest time point
  - Bootstrap to come up with a measure of variation for expected death rate

Table One

- Our Table One shows that:

Table One for Period 39:

		Stratified by death30			
	level	0	1	p	test
n		3885	118		
proced (%)	0	740 (19.0)	19 (16.1)	0.493	
	1	3145 (81.0)	99 (83.9)		
asa (%)	1	5 (0.1)	0 (0.0)	0.002	
	2	180 (4.6)	3 (2.5)		
	3	778 (20.0)	15 (12.7)		
	4	2915 (75.0)	98 (83.1)		
	5	7 (0.2)	2 (1.7)		
bmi (mean (sd))		28.60 (3.81)	29.28 (3.56)	0.053	
death30 (%)	0	3885 (100.0)	0 (0.0)	<0.001	
	1	0 (0.0)	118 (100.0)		

- ASA looks highly associated, BMI and procedure do not

Missing Data

- We think that our estimates may be biased

	Missing	Not Missing
BMI	0.06837607	0.03179952
Procedure	0.07650273	0.03184321
ASA	0.05120482	0.03229425

• Our missing and non-missing data look like they have different distributions

Final Table

	observed	expected	clinical	lower_bound	upper_bound	conf_interval
1	0.011904762	0.02989646	-1	0.02768996	0.03192073	-1
2	0.010101010	0.03198527	-1	0.02959428	0.03416305	-1
3	0.044943820	0.03187255	1	0.02959570	0.03400581	1
4	0.035714286	0.03090991	0	0.02872618	0.03296739	1
5	0.009433962	0.03151042	-1	0.02923042	0.03352998	-1
6	0.020833333	0.02913291	-1	0.02711567	0.03107068	-1
7	0.073684211	0.02951406	1	0.02742981	0.03149568	1
8	0.027027027	0.03161003	0	0.02933770	0.03376541	-1
9	0.000000000	0.03008586	-1	0.02791560	0.03208818	-1
10	0.021978022	0.03084233	-1	0.02864901	0.03283701	-1
11	0.011627907	0.02951445	-1	0.02740382	0.03148552	-1
12	0.043010753	0.03195193	1	0.02969965	0.03410002	1
13	0.038461538	0.03102376	1	0.02881364	0.03305978	1
14	0.010752688	0.02891176	-1	0.02686162	0.03086314	-1
15	0.031250000	0.03138988	0	0.02914651	0.03343364	0
16	0.009433962	0.02977121	-1	0.02766852	0.03178263	-1
17	0.130952381	0.03267506	1	0.03031308	0.03491193	1
18	0.022471910	0.03002540	-1	0.02783499	0.03200261	-1
19	0.000000000	0.02960688	-1	0.02752403	0.03152051	-1
20	0.021978022	0.02755774	-1	0.02549807	0.02945412	-1
21	0.046511628	0.03050821	1	0.02831036	0.03249475	1
22	0.025000000	0.03057741	0	0.02838460	0.03257974	-1
23	0.045977011	0.02867540	1	0.02672366	0.03059846	1
24	0.040404040	0.03049346	1	0.02827324	0.03242660	1
25	0.032608696	0.03001628	0	0.02782141	0.03203647	1

	observed	expected	clinical	lower_bound	upper_bound	conf_interval
26	0.043010753	0.03053944	1	0.02838512	0.03257998	1
27	0.011111111	0.03192322	-1	0.02956858	0.03413996	-1
28	0.051546392	0.03195617	1	0.02961900	0.03409841	1
29	0.022471910	0.03017106	-1	0.02793786	0.03219075	-1
30	NA	NA	0	NA	NA	0
31	0.060000000	0.02965212	1	0.02748576	0.03159936	1
32	0.000000000	0.03108331	-1	0.02887100	0.03314902	-1
33	0.000000000	0.03044560	-1	0.02827995	0.03247743	-1
34	0.102272727	0.03036550	1	0.02822778	0.03233909	1
35	0.051948052	0.02978611	1	0.02763399	0.03176449	1
36	0.010638298	0.02876738	-1	0.02668481	0.03068228	-1
37	0.038461538	0.02924832	1	0.02714090	0.03125217	1
38	0.009615385	0.02983629	-1	0.02768061	0.03178290	-1
39	0.041666667	0.03038104	1	0.02829954	0.03238615	1
40	0.025316456	0.02947941	0	0.02737131	0.03142336	-1
41	0.036697248	0.02957494	1	0.02747166	0.03153153	1
42	0.000000000	0.02875776	-1	0.02666075	0.03069963	-1
43	0.025316456	0.03020421	0	0.02808236	0.03221748	-1
44	0.000000000	0.03035579	-1	0.02820402	0.03229879	-1

Final Conclusions

- Hospitals with higher than expected death rates: (16)
  - 3, 7, 12, 13, 17, 21, 23, 24, 26, 28, 31, 34, 35, 37, 39, and 41
- Hospitals with lower than expected death rates: (20)
  - 1, 2, 5, 6, 9, 10, 11, 14, 16, 18, 19, 20, 27, 29, 32, 33, 36, 38, 42, and 44
- Concerns:
  - Hospital 30
  - That our estimates may be biased from the missing data