

Correlation between tobacco usage, oral health, and chronic health in US

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Topic: Tobacco use

- Tobacco use is the leading cause of preventable disease, disability, and death in the US
- ~40 million U.S. adults still smoke cigarettes; about 16 million Americans live with serious illness caused by smoking
- Study the association between health variables (oral health and chronic health) and tobacco use

Scientific Questions

- Is there an association between **tobacco use and oral health** among residents in the United State in 2020? Does the association differ between gender? Does it differ between race/ ethnicity?
- Is there an association between **tobacco use and chronic health** among residents in the United State in 2020? Does the association differ between gender? Does it differ between race/ ethnicity?

Behavioral Risk Factor Surveillance System (BRFSS)



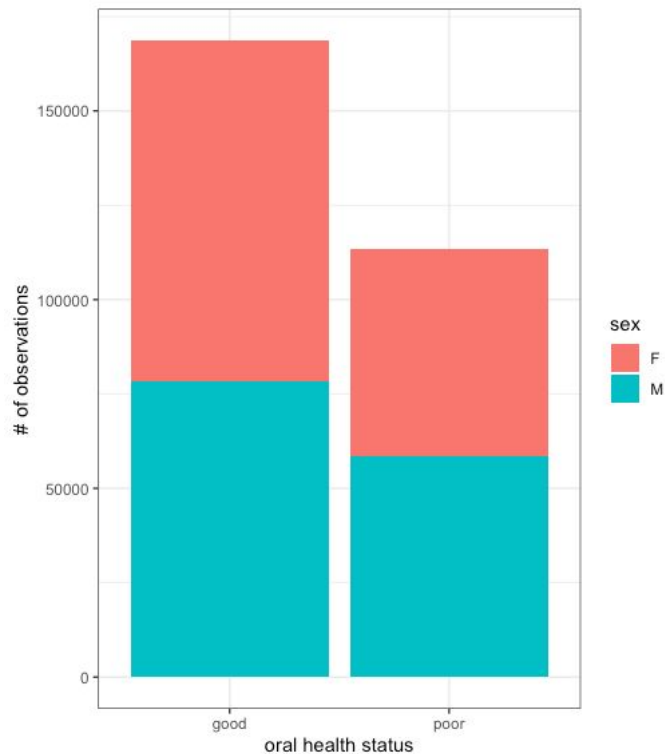
- the nation's premier system of health-related telephone surveys in all 50 states as well as the District of Columbia and three U.S. territories
- Data collection on health-related risk behaviors and events, chronic health conditions, use of preventive service, etc
- Survey conducted using Random Digit Dialing (RDD) techniques on both landlines and cell phones
- Use standardized core questionnaire, modules, and state-added questions

Data Set (BRFSS Year 2020)

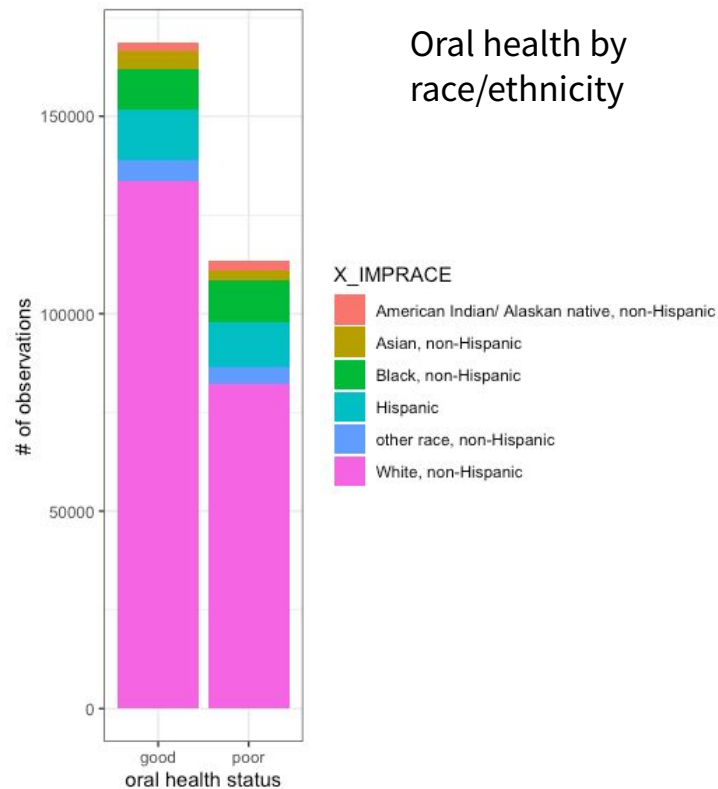
- Response variables:
 - Oral health (dental visit, teeth removed)
 - Chronic health (indicator of heart disease, stroke, asthma, cancer, Chronic Obstructive Pulmonary Disease, diabetes)
- Predictor variable: Tobacco use
- Variables adjusted:
 - Age, gender, race/ ethnicity, income level, health insurance status, BMI (overweight/ obese), education level

Descriptive statistics

Oral health
by sex

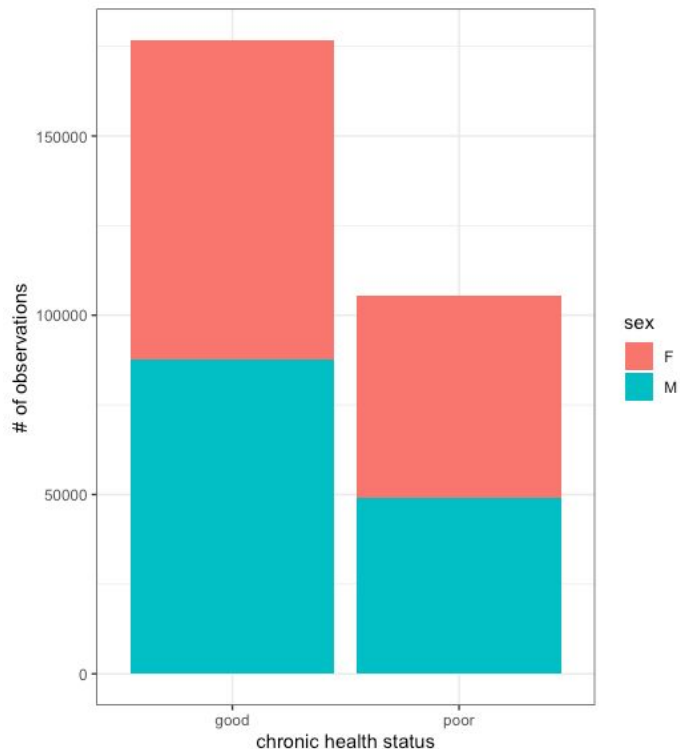


Oral health by
race/ethnicity

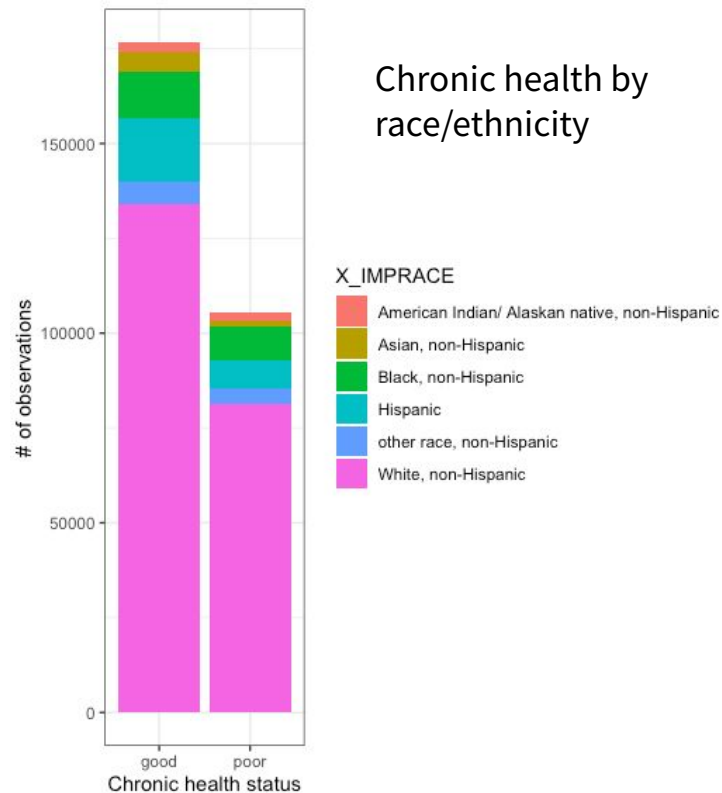


Descriptive statistics

Chronic health by sex

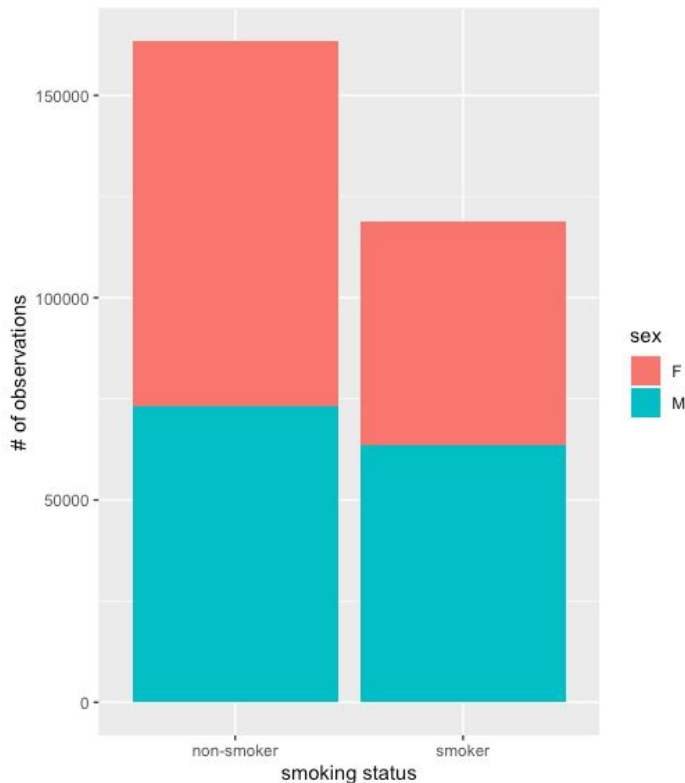


Chronic health by race/ethnicity

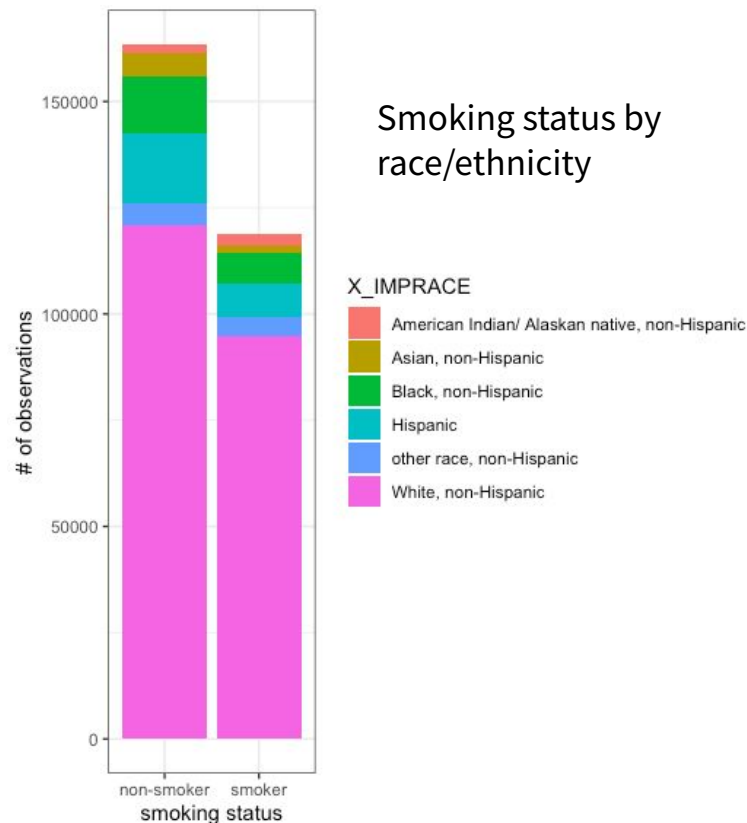


Descriptive statistics

Smoking status by sex



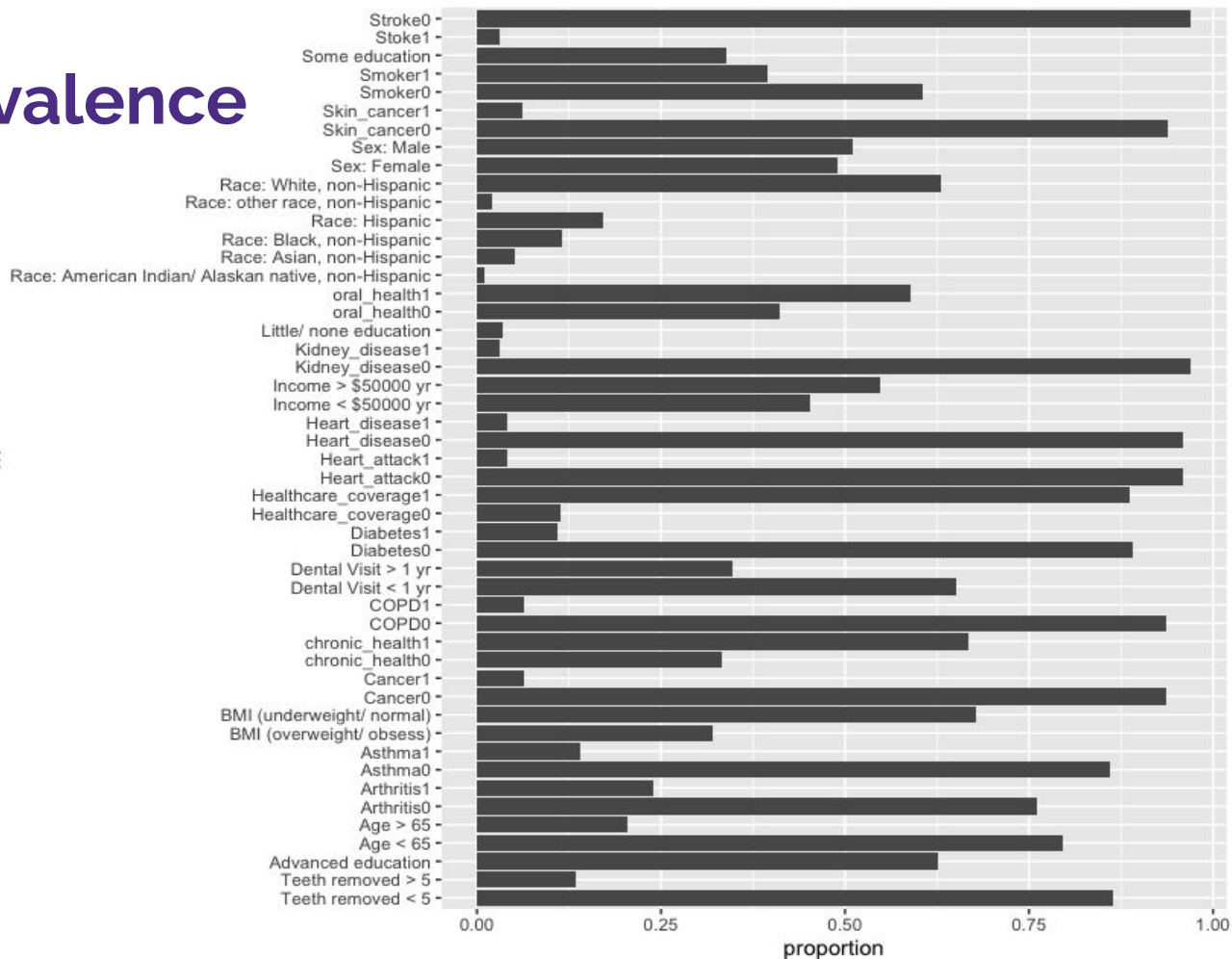
Smoking status by race/ethnicity



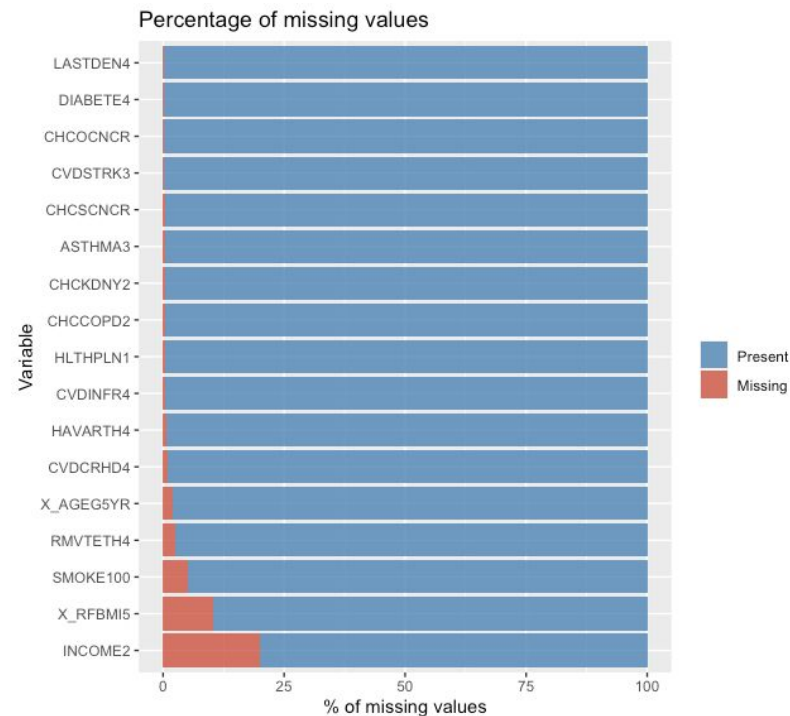
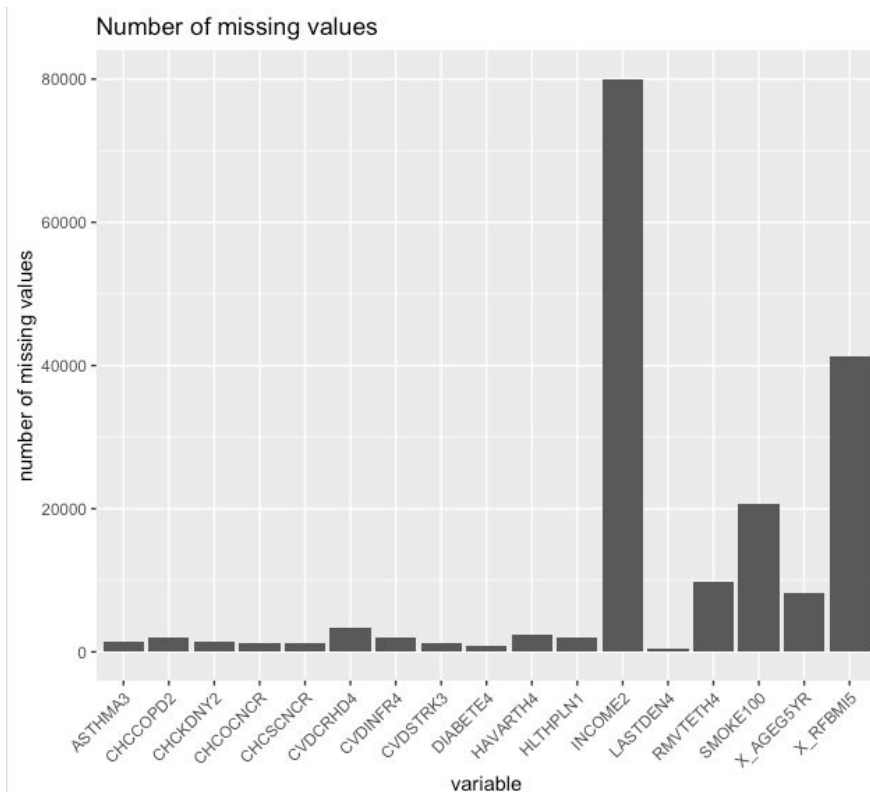
Weighted Prevalence

- Balanced proportion of female and male
- Unbalanced proportion of different race and ethnicity

hv

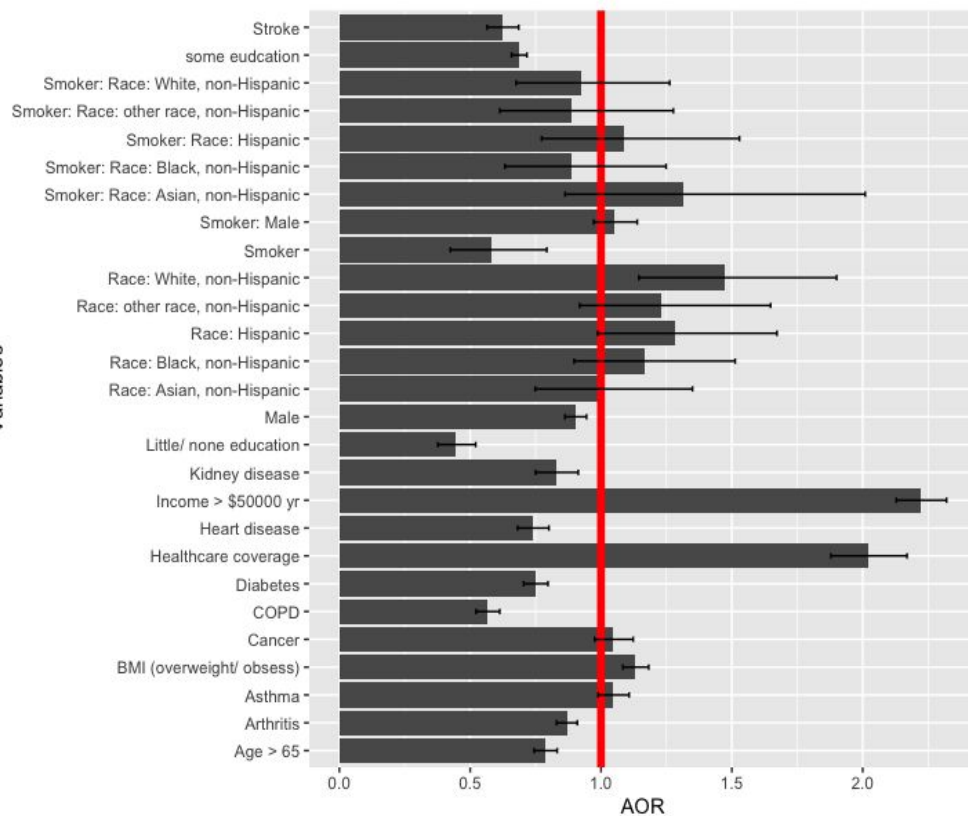


Missing Data



Oral health ~ smoking status

Variables



	Estimate	Std. Error	t value	Pr(> t)	2.5 %	97.5 %
(Intercept)	-0.36695	0.1333	-2.7525	5.91e-03	-0.6282	-0.1057
Smoker	-0.54444	0.1593	-3.4167	6.34e-04	-0.8568	-0.2321
Sex: Male	-0.23927	0.0285	-8.3854	5.08e-17	-0.2952	-0.1833
Race: Asian, non-Hispanic	0.00494	0.1505	0.0328	9.74e-01	-0.2900	0.2999
Race: Black, non-Hispanic	0.15280	0.1332	1.1468	2.51e-01	-0.1084	0.4140
Race: Hispanic	0.25073	0.1345	1.8638	6.24e-02	-0.0129	0.5144
Race: <u>other</u> race, non-Hispanic	0.20726	0.1492	1.3889	1.65e-01	-0.0852	0.4997
Race: White, non-Hispanic	0.38869	0.1293	3.0059	2.65e-03	0.1352	0.6421
Age > 65	-0.10282	0.0234	-4.3854	1.16e-05	-0.1488	-0.0569
Income > \$50000 yr	0.79860	0.0220	36.2263	1.09e-286	0.7554	0.8418
Healthcare coverage	0.70261	0.0367	19.1497	1.10e-81	0.6307	0.7745
BMI (overweight/ obese)	0.12382	0.0223	5.5645	2.63e-08	0.0802	0.1674
Education:	-0.81434	0.0830	-9.8138	9.91e-23	-0.9770	-0.6517
little/ <u>none</u> education						
Education:	-0.37573	0.0218	-17.2071	2.54e-66	-0.4185	-0.3329
some education						
Heart disease	-0.30308	0.0414	-7.3130	2.62e-13	-0.3843	-0.2219
Stroke	-0.47435	0.0493	-9.6161	6.89e-22	-0.5710	-0.3777
Asthma	0.04545	0.0289	1.5711	1.16e-01	-0.0112	0.1021
Cancer	0.04552	0.0360	1.2663	2.05e-01	-0.0249	0.1160
COPD	-0.56947	0.0407	-13.9952	1.73e-44	-0.6492	-0.4897
Arthritis	-0.14059	0.0233	-6.0280	1.66e-09	-0.1863	-0.0949
Kidney disease	-0.18948	0.0503	-3.7661	1.66e-04	-0.2881	-0.0909
Diabetes	-0.28837	0.0316	-9.1277	7.04e-20	-0.3503	-0.2265
Smoker * Sex: Male	0.05055	0.0404	1.2521	2.11e-01	-0.0286	0.1297
Smoker * Race:	0.27522	0.2157	1.2757	2.02e-01	-0.1476	0.6981
Asian, non-Hispanic						
Smoker * Race:	-0.11760	0.1734	-0.6783	4.98e-01	-0.4574	0.2222
Black, non-Hispanic						
Smoker * Race: Hispanic	0.08353	0.1741	0.4798	6.31e-01	-0.2577	0.4247
Smoker * Race:	-0.12231	0.1870	-0.6540	5.13e-01	-0.4888	0.2442
<u>other</u> race, non-Hispanic						

Oral health ~ smoking status

Interpretation:

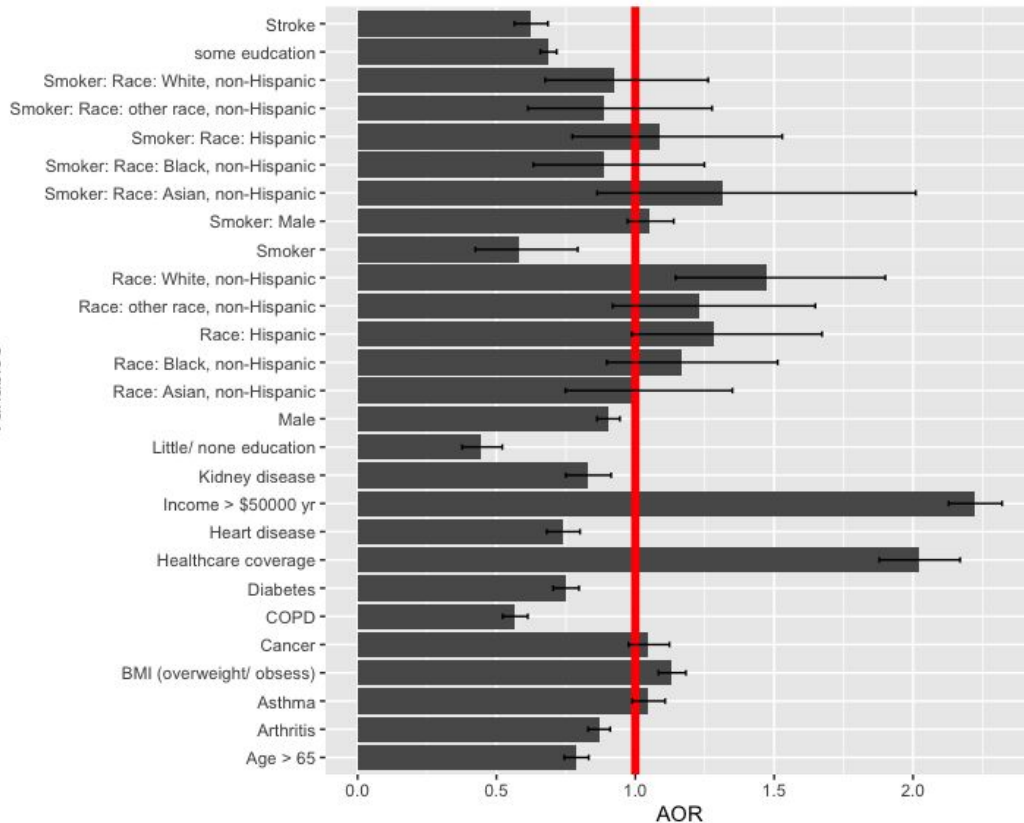
The odds of having good oral health is estimated to be 42% lower for smokers compared to non-smokers, adjusting for all the other variables.

We have sufficient evidence that the OR is different from 1 at the 0.05 level ($p = 0.000634$)

- No evidence for interaction between smoking status and Sex (Wald test, $p=0.211$)
- There is evidence for interaction between smoking status and Race/ ethnicity (Wald test, $p=0.0478$)
- Using regTermTest instead of anova

	AOR	2.5 %	97.5 %
Smoker	0.580	0.425	0.793
Age > 65	0.787	0.744	0.832
Race: Asian, non-Hispanic	1.005	0.748	1.350
Race: Black, non-Hispanic	1.165	0.897	1.513
Race: Hispanic	1.285	0.987	1.673
Race: other race, non-Hispanic	1.230	0.918	1.648
Race: White, non-Hispanic	1.475	1.145	1.901
Male	0.902	0.862	0.945
Income > \$50000 yr.	2.222	2.128	2.321
Healthcare coverage	2.019	1.879	2.170
BMI (overweight/ obese)	1.132	1.084	1.182
Education: Little/ none education	0.443	0.376	0.521
Education: some education	0.687	0.658	0.717
Heart disease	0.739	0.681	0.801
Stroke	0.622	0.565	0.685
Asthma	1.046	0.989	1.108
Cancer	1.047	0.975	1.123
COPD	0.566	0.522	0.613
Arthritis	0.869	0.830	0.909
Kidney disease	0.827	0.750	0.913
Diabetes	0.749	0.704	0.797
Smoker * Male	1.052	0.972	1.138
Smoker * Race: Asian, non-Hispanic	1.317	0.863	2.010
Smoker * Race: Black, non-Hispanic	0.889	0.633	1.249
Smoker * Race: Hispanic	1.087	0.773	1.529
Smoker * Race: other race, non-Hispanic	0.885	0.613	1.277
Smoker * Race: White, non-Hispanic	0.923	0.675	1.263

Chronic health ~ smoking status



	Estimate	Std. Error	t value	Pr(> t)	2.5 %	97.5 %
(Intercept)	1.10726	0.1502	7.372	1.69e-13	0.8129	1.4017
Smoker	-0.33233	0.1751	-1.898	5.77e-02	-0.6755	0.0108
Sex: Male	0.07139	0.0287	2.487	1.29e-02	0.0151	0.1276
Race: Asian, non-Hispanic	0.52908	0.1689	3.133	1.73e-03	0.1981	0.8601
Race: Black, non-Hispanic	-0.02505	0.1503	-0.167	8.68e-01	-0.3196	0.2695
Race: Hispanic	0.21319	0.1522	1.401	1.61e-01	-0.0852	0.5115
Race: other race, non-Hispanic	0.03990	0.1637	0.244	8.07e-01	-0.2809	0.3607
Race: White, non-Hispanic	0.19414	0.1464	1.326	1.85e-01	-0.0929	0.4812
Age > 65	-0.78719	0.0233	-33.751	3.27e-249	-0.8329	-0.7415
Income > \$50000 yr	0.34659	0.0225	15.375	2.51e-53	0.3024	0.3908
Healthcare coverage	-0.36356	0.0404	-8.988	2.52e-19	-0.4428	-0.2843
BMI (overweight/ obese)	0.33075	0.0229	14.462	2.18e-47	0.2859	0.3756
Education: little/ none education	-0.10496	0.0778	-1.348	1.78e-01	-0.2575	0.0476
Education: some education	0.00478	0.0229	0.208	8.35e-01	-0.0401	0.0497
Heart attack	-1.78907	0.0575	-31.127	2.37e-212	-1.9017	-1.6764
Arthritis	-0.80313	0.0228	-35.196	9.06e-271	-0.8479	-0.7584
Smoker * Male	0.17674	0.0407	4.347	1.38e-05	0.0971	0.2564
Smoker * Race: Asian, non-Hispanic	-0.20540	0.2311	-0.889	3.74e-01	-0.6584	0.2476
Smoker * Race: Black, non-Hispanic	-0.04066	0.1864	-0.218	8.27e-01	-0.4060	0.3247
Smoker * Race: Hispanic	-0.00586	0.1893	-0.031	9.75e-01	-0.3768	0.3651
Smoker * Race: other race, non-Hispanic	-0.17707	0.2024	-0.875	3.82e-01	-0.5737	0.2195
Smoker * Race: White, non-Hispanic	-0.05224	0.1754	-0.2998	7.66e-01	-0.3961	0.2916

Chronic health ~ smoking status

Interpretation:

The odds of having good chronic health status is estimated to be 28.3% lower for smokers compared to non-smokers, adjusting for all the other variables.

We do not have sufficient evidence that the OR is different from 1 at the 0.05 level ($p = 0.0577$)

- There is evidence for interaction between smoking status and Sex (Wald test, $p=0.0000138$)
- No evidence for interaction between smoking status and Race/ ethnicity (Wald test, $p=0.702$)
- Using regTermTest instead of anova

	AOR	2.5 %	97.5 %
Smoker	0.717	0.509	1.011
Age > 65	1.074	1.015	1.136
Race: Asian, non-Hispanic	1.697	1.219	2.363
Race: Black, non-Hispanic	0.975	0.726	1.309
Race: Hispanic	1.238	0.918	1.668
Race: other race, non-Hispanic	1.041	0.755	1.434
Race: White, non-Hispanic	1.214	0.911	1.618
Male	0.455	0.435	0.476
Income > \$50000 yr	1.414	1.353	1.478
Healthcare coverage	0.695	0.642	0.753
BMI (overweight/ obese)	1.392	1.331	1.456
Education: little/ none education	0.900	0.773	1.049
Education: some education	1.005	0.961	1.051
Heart attack	0.167	0.149	0.187
Arthritis	0.448	0.428	0.468
Smoker * Male	1.193	1.102	1.292
Smoker * Race: Asian, non-Hispanic	0.814	0.518	1.281
Smoker * Race: Black, non-Hispanic	0.960	0.666	1.384
Smoker * Race: Hispanic	0.994	0.686	1.441
Smoker * Race: other race, non-Hispanic	0.838	0.563	1.246

Discussion

- Surprise to see evidence for effect modification of Sex for the association between smoking status and chronic health
- Limitation of Survey data (missing values in income levels)
- Cross-sectional vs. Longitudinal