

December, 2014

Center for Health Systems  
Research and Development

## Tooth loss, general health, and healthy life styles in North Carolina

Data from the Behavioral Risk Factor Surveillance System, Years 2006, 2008, & 2010

### Summary and Data Highlights

This study investigated the relationships among tooth loss, health, and health-related behaviors using data from North Carolina Behavioral Risk Factors Surveillance System (NC BRFSS). NC BRFSS collects data regarding oral care and tooth loss in even number years. BRFSS data from 2006, 2008, & 2010 were combined for these analyses. SUDAAN statistical software, was used for analyses to make adjustments for sampling bias.

#### Key findings:

- Disparities by demographic variables.** The number of teeth removed varied greatly according to demographic variables such as age, region of residence, education, income, and race/ethnicity. Substantial loss of teeth (6 or more) is greatest for residents of Western and Eastern North Carolina who have less education, annual incomes less than \$15,000, or African Americans.
  - **Age:** While nearly 80% of adults younger than age 35 reported they have all of their teeth, tooth loss increases with age. Only 57% of adults between 35 and 49 years old retain all of their teeth, 36% of those 50 to 64, and 20% of adults 65 or older.
  - **Region:** More people in the Western region have lost all of their teeth (9.2%) than in the East (6.6%) or Piedmont (5.8%).
  - **Education:** Eighteen percent of adults with less than high school education lost all teeth compared to 8% of high school graduates, 4% of those with some post high school education and 1% of college or technical school graduates.
  - **Income:** Over a third of low income older adults (income below \$15,000) reported loss of all of their natural teeth; three times more than those with income at or above \$15,000 (34% vs 11%).
  - **Race/ethnicity:** Fifty five percent of Whites retained all teeth whereas 39% of African Americans and 35% of Native Americans kept all of natural teeth.
- Relationships between health and tooth loss.** Loss of teeth is shown to be strongly associated to health. The more teeth are removed, the poorer health is likely to become. Losing teeth has detrimental effects especially upon adults younger than 65. Health related variables were examined separately for two age groups (18-64 and older than 64) which included poor general health (fair-

poor), diabetes, heart disease, stroke, obesity, disability, physically and mentally healthy days, and having adequate sleep.

- **General health:** Nearly 20% of adults under 65 who lost 1 to 5 teeth reported poor-fair health compared to 8% of those who retained all their natural teeth. Fair-poor health was reported by 36% of those who lost 6 or more teeth, and 48% of those who had lost all natural teeth.
- **Diabetes:** Retention of natural teeth and occurrence of diabetes are significantly related. For adults over 65 years old who had lost all of their natural teeth, the prevalence of diabetes is twice that of those who retained all of their teeth (14.8% vs. 30.3%). For the younger age group, the effect of tooth loss is even greater: 25% of those who had lost all of their natural teeth had diabetes, a six fold increase over those who retained all of their teeth (4.4%).
- **Heart disease:** Prevalence of heart disease is also strongly related to tooth loss. Seventeen percent of the older adults who lost all of their natural teeth reported having heart disease, 1.7 times higher than those who retained all of their natural teeth (10.1%). The effect of edentulism, losing all natural teeth, is even greater for the younger group. 12.5% of younger adults who lost all of their natural teeth had heart disease, 9 times the increase of those who retained all of their natural teeth (1.4%).
- **Stroke:** Tooth loss is strongly associated with incidence of stroke. Older adults who lost all of their natural teeth were 1.8 times more likely to have a stroke compared to those who retained all of their teeth (12.2% vs. 6.8%). For the younger group, 9% of adults who lost all teeth had a stroke as compared to less than one percent of those who retained all teeth.
- **BMI:** The percent of those who had all of their natural teeth is highest among those whose weight is normal: 65.9% for younger adults and 23.9% for older adults with normal weight compared to 50.4% of younger adults and 15.0% of older adults who were obese retained all teeth. Higher percent older adults who lost 6 or more teeth were obese.
- **Sleep:** Insufficient sleep was more pronounced among those with the most tooth loss, especially among the elderly. Thirty percent of older adults who lost all of their natural teeth reported they had 20-30 days of not getting enough sleep compared to 14% of those who retained all of their teeth.
- **Physical and mental disability:** The association between tooth loss and disabilities is more prominent among the younger age group. Compared to the adults who retained all their teeth, those who had lost 1-5 teeth were 1.8 times more likely to have physical and mental disabilities (12.1% vs. 21.2%) and those who lost all teeth were 3.9 times more likely.

- **Health problems requiring special equipment:** This effect is particularly apparent for the younger age group: Compared to those who had all of their teeth, those who lost all teeth were 7 times more like to report disability needing special equipment (2.8% vs. 21.1%).
- **Physically healthy days:** For younger adults, those who kept all of their teeth reported more physically healthy days compared to those who lost 6 or more teeth. For older adults, those who lost 6 or more teeth reported more unhealthy days than those who lost fewer teeth.

### 3. Relationships between health-related behavioral variables and tooth loss.

Health-related behavioral variables include smoking, drinking, exercise, having health insurance, emotional support, and life satisfaction. Healthy life styles are associated with reduced tooth loss. Smoking is strongly associated with tooth loss, even among former smokers. Generally, those adults who lost all teeth have less emotional support and lower life satisfaction ratings than those who retained more natural teeth.

- **Smoking:** Daily smokers lost more teeth than non-smokers or those who were occasional or former smokers. Among the adults ages 18-64, 68% of those who never smoked retained their natural teeth compared to 42% of daily smokers. For both age groups, significantly more people who smoked lost all the teeth when compared to those who never smoked.
- **Exercise:** More adults who participated in any type of exercise retained all of their natural teeth than those who did not participate in any type of exercise (63.0% vs 44.4% for younger adults; 22.9% vs. 15.1% for older adults, respectively). Adults who lost all of their teeth were less like to participate in any type of exercise.
- **Health insurance:** Adults without health insurance lost more teeth than those with health insurance. For those ages 18-64, 61% of adults with health insurance had all of their natural teeth compared to 50% of those who were insured.
- **Emotional support:** Adults who retained all natural teeth had more emotional support than those who lost all of teeth.
- **Life satisfaction:** Adults who lost all of their natural teeth were more likely to report dissatisfaction. Older adults who lost fewer than 6 teeth were more likely to report being very satisfied than those who lost more teeth.

### Conclusion:

Tooth loss is associated with many health problems. There are disparities in tooth loss by demographic variables. Tooth loss is also related to life styles such as smoking, exercise, and having emotional support. Greater tooth retention is an indicator of better general health.

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## Introduction

Research has shown that good oral health is related to good general health and quality of life, especially when permanent teeth are retained.<sup>1-4</sup> This report presents a comprehensive review of the effect of tooth loss on health and its association with other demographic and health related variables by analyzing the data from North Carolina Behavioral Risk Factor Surveillance System (NC BRFSS).

The NC BRFSS is a state-specific national telephone survey of adults 18 years or older that annually collects data on health-related behavior and risk factors. It is conducted by the Centers for Disease Control and Prevention (CDC) in collaboration with North Carolina State Center for Health Statistics (SCHS).<sup>5</sup> The questionnaire includes data on health risk behaviors and the use of health services. Questions regarding dental health were asked every other year. In this study, the NC BRFSS data from three recent years, 2006, 2008, and 2010 were combined to obtain large sample sizes for valid comparisons. SAS and SUDAAN statistical software were used for analyses.<sup>6</sup>

The North Carolina BRFSS asks the following question related to tooth loss every other year: “How many of your permanent teeth have been removed because of tooth decay or gum disease? Do not include teeth lost for other reasons, such as injury or orthodontics”. The respondents must choose one from the following four answers: 1) None; 2) 1 to 5; 3) 6 or more but not all; and 4) all.

Part I of this report first examines demographic variables that relate to tooth loss including age, gender, region, education, income and race/ethnicity in North Carolina. As described in this report, age is a crucial determinant that affects the retention of teeth. In recent years, the proportion of older adults who preserve all or most of their natural teeth has been increasing. However, there are disparities in rates of natural tooth retention by demographic factors such as income, education, race/ethnicity.

Next, in Part 2, health variables associated to tooth loss are examined. These variables include general health, number of physically and mentally healthy days, amount of sleep, occurrence of diabetes and heart disease, BMI, and disability. Studies have shown that oral health is strongly related not only to the subjective sense of well-being, but to several chronic diseases such as diabetes and heart disease.<sup>7-15</sup> Loss of a substantial number of natural teeth (here, 6 or more) might affect everyday life --- physical activities and mental health. In this report, health related variables are examined separately for adults younger than 65 and for those 65 or older. Reasons for this division are: 1) There are substantially more adults losing more natural teeth with advanced age; 2) Older adults are generally less healthy than younger adults so the effect of multiple tooth loss might be different.

Lastly, in Part 3, health risk factors related to healthy life styles such as smoking, drinking, and lack of exercise are explored as related to tooth loss. Studies have shown smoking and drinking affect oral health.<sup>16</sup> The extent of the effect on tooth loss by those life-style choices is examined with other demographic variables. Associations might not be direct as these variables are intrinsically related to health and demographic variables. However, the results seem to present a general image of “healthy life styles” which include good oral health.

In Part 4, logistic regression analyses explore the degree of risk associated with factors affecting tooth loss.



## Part 1. Demographic variables related to tooth loss

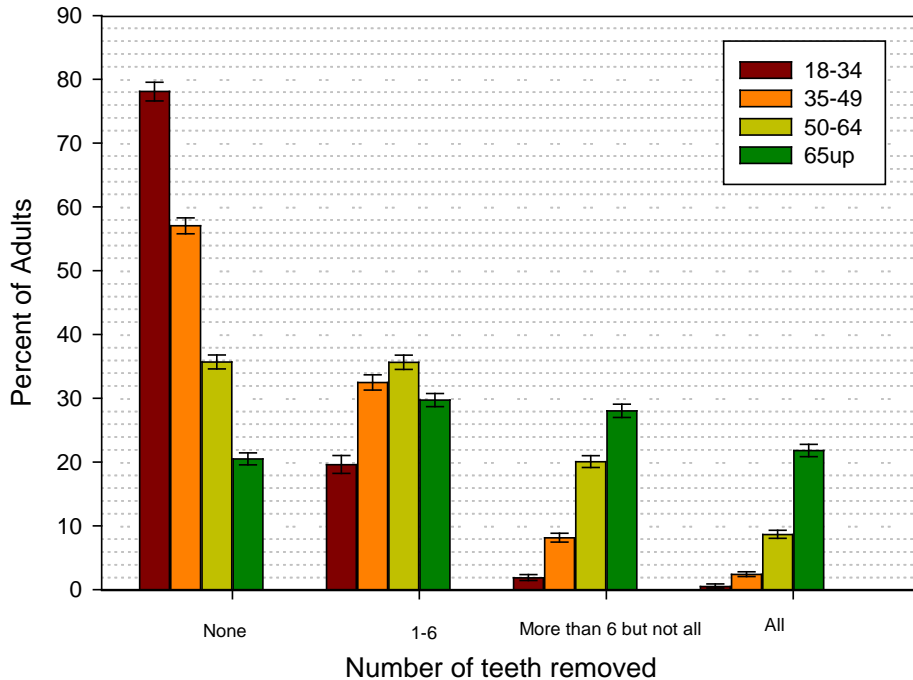
In this part, disparities in tooth loss are examined in relationship to the demographic variables of age, gender, region of residence, education, income and race/ethnicity.

### 1. Tooth loss by age groups: None, 1-5, 6 or more but not all, and all (age groups, 18-34, 35-49, 51-64, 65 & up)

Age is strongly associated with tooth loss. While nearly 80% of adults under age 35 reported that they have all of their teeth, the number of teeth lost increases with age. Fifty-seven percent of those between 35 and 49 years old report having all their teeth; 36% of those between 50 and 64 years old; and, only 20% of adults who 65 or older retain all of their teeth. Conversely, 22% of those ages 65 or older have lost all of their teeth compared to 9% of those 50-64, 2% of those 35-49, and less than 1% of those 18-34. (Figure 1).

Though there are gender differences in oral care, e.g., females make more frequent dental visits than males, the percent of tooth loss is very similar among males and females in North Carolina (Figure not shown).

Figure 1. Percent of Adults with Tooth Loss by Age and by Number of Teeth Extracted, NC BRFSS 2006, 2008, & 2010 Combined

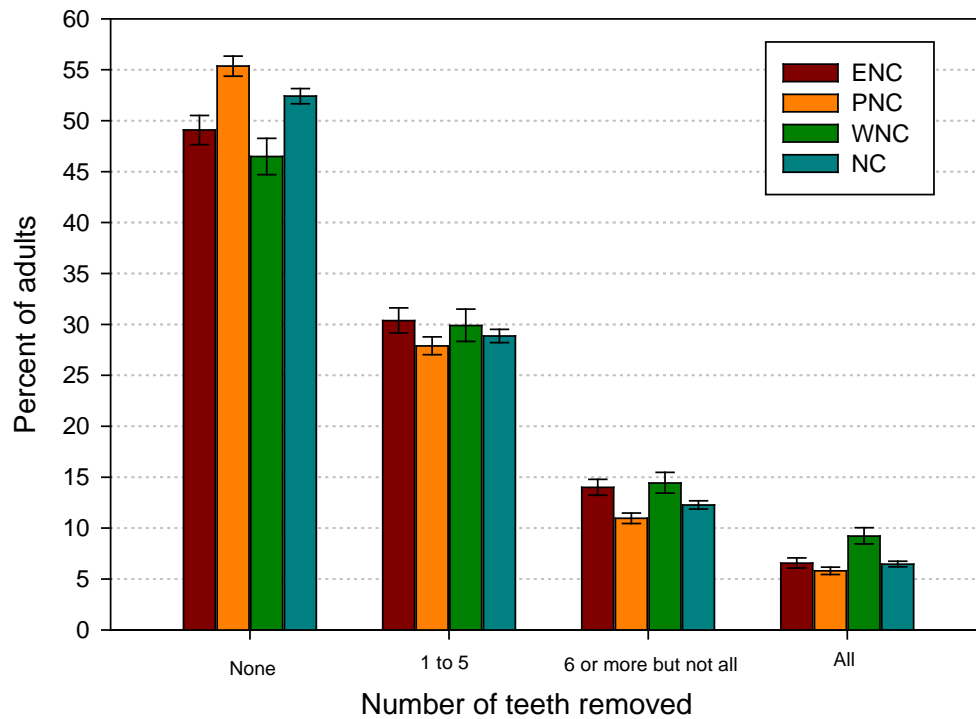


	18-34	35-49	50-64	65 up	18-34	35-49	50-64	65 up	18-34	35-49	50-64	65 up	18-34	35-49	50-64	65 up
N	4331	6174	4684	2484	1304	3442	4677	3741	128	937	2756	3484	25	259	1236	2784
Mean %	78.1	57.0	35.7	20.5	19.6	32.5	35.6	29.7	1.8	8.1	20.0	28.0	0.5	2.4	8.6	21.8
LCI	76.6	55.8	34.6	19.6	18.2	31.3	34.5	28.7	1.4	7.4	19.1	27.0	0.3	2.0	8.0	20.8
UCI	79.6	58.3	36.8	21.4	21.0	33.7	36.8	30.7	2.4	8.8	21.0	29.1	0.9	2.8	9.3	22.8

## 2. North Carolina region: Eastern, Piedmont, Western

Generally, adult tooth loss is higher for residents of Eastern or Western North Carolina than for the Piedmont. More people in the Western region have lost all of their teeth (9.2%) than in the East (6.6%) or Piedmont (5.8%). The regional difference is greatest for those who retained all of their teeth. Well over half (55.4%) of those living in the Piedmont region had no teeth removed compared to 49.1% those in Eastern and 46.5% of those in Western Region. (Figure 2).

**Figure 2. Percent of Adults with Tooth Loss by Region and by Number of Teeth Removed, NC BRFSS 2006, 2008, & 2010 Combined**

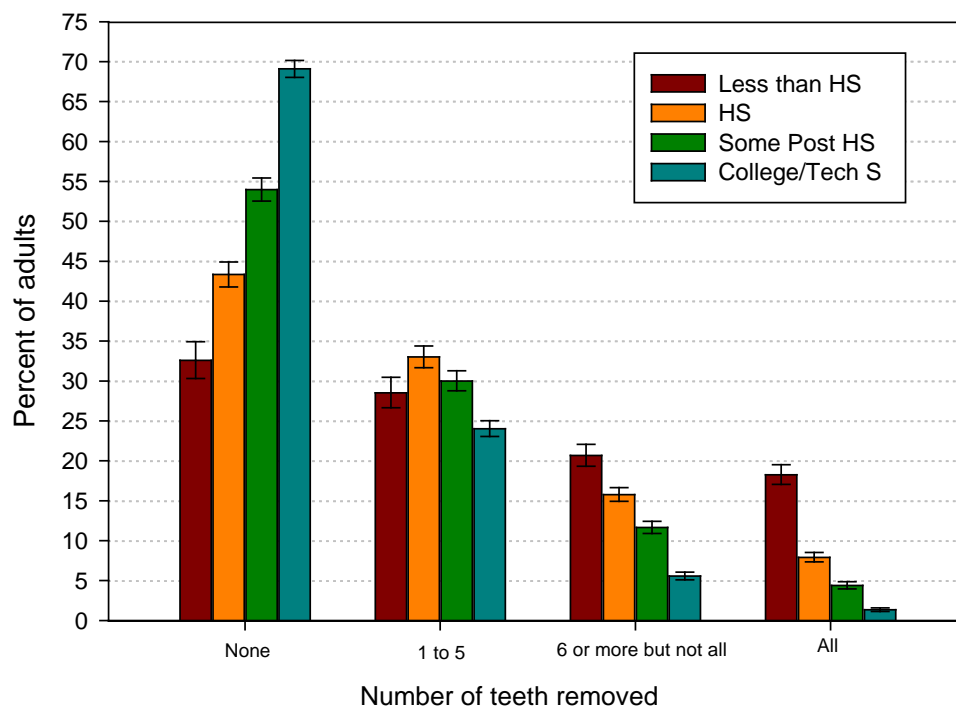


	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	5110	10312	2397	17819	4414	6942	1926	13282	2568	3569	1205	7342	1334	2110	887	4331
Mean %	49.1	55.4	46.5	52.4	30.4	27.9	29.9	28.9	14.0	11.0	14.4	12.3	6.6	5.8	9.2	6.5
LCI	47.7	54.4	44.7	51.7	29.2	27.0	28.3	28.2	13.2	10.4	13.4	11.9	6.1	5.4	8.4	6.2
UCI	50.5	56.3	48.3	53.2	31.6	28.8	31.5	29.5	14.8	11.5	15.5	12.7	7.1	6.2	10.0	6.7

### 3. Education

The number of teeth removed varies greatly by level of education. Nearly 70% of adults who had college or technical school education retained all of natural teeth. By contrast, only 33% of those less than high school education retained all of natural teeth, compared to 43% of high school graduates, and 54% with post high school education. More adults who did not complete high school had lost 6 or more teeth compared to those who completed high school or had college education (21%, 16%, & 6%, respectively). Eighteen percent of those who had less than high school education lost all teeth compared to 8% of high school graduates, 4% of those with some post high school education and 1% of college or technical school graduates. (Figure 3).

**Figure 3. Percent of Adults with Tooth Loss by Education and by Number of Teeth Removed, NC BRFSS 2006, 2008, & 2010 Combined**

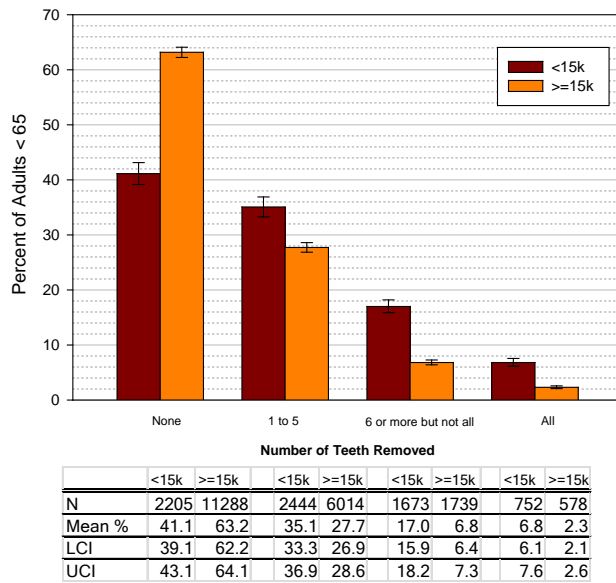


	L HS	HS	HS+	Col	L HS	HS	HS+	Col	L HS	HS	HS+	Col	L HS	HS	HS+	Col
N	1064	3742	4622	8356	1488	4419	3725	3623	1743	2808	1747	1034	1759	1602	715	245
Mean %	32.6	43.3	54.0	69.1	28.5	33.0	30.0	24.0	20.7	15.8	11.6	5.6	18.2	7.9	4.4	1.3
LCI	30.3	41.8	52.5	68.0	26.6	31.7	28.8	23.1	19.3	14.9	10.9	5.1	17.1	7.3	3.9	1.1
UCI	34.9	44.9	55.4	70.1	30.5	34.4	31.3	25.0	22.1	16.6	12.4	6.1	19.5	8.5	4.9	1.6

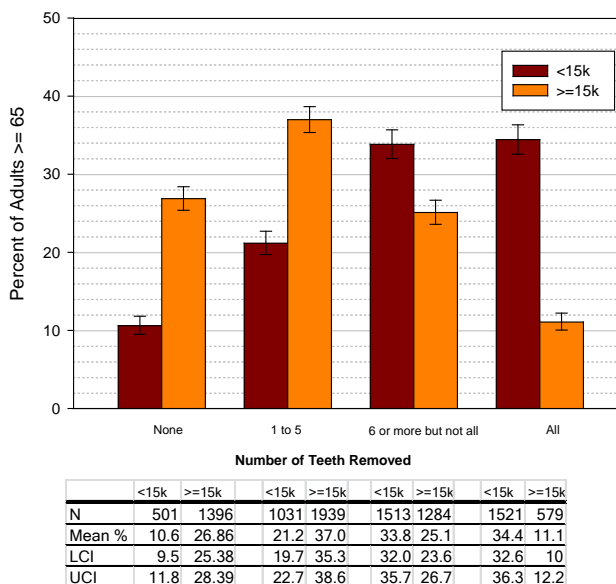
### 4. Income

Income is very strongly associated with tooth loss. Adults with an annual income less than \$15,000 generally lost more teeth than those with an annual income at or above \$15,000. The effect of income on retention of teeth is remarkably large among older adults. Over a third of low income older adults (income below \$15,000) had lost all of their natural teeth, which is three times more than those with income at or above \$15,000 (34% vs 11%). (Figure 4a & 4b).

**Figure 4a. Percent of Adults with Tooth Loss by Income and by Number of Teeth Removed, Ages 18-64, NC BRFSS 2006, 2008, & 2010 Combined**



**Figure 4b. Percent of Adults with Tooth Loss by Income and by Number of Teeth Removed, Ages 65 or Older, NC BRFSS 2006, 2008, & 2010 Combined**



### 5. Race/ethnicity

There are large differences in tooth loss by race/ethnicity. In general, more African Americans and Native Americans lost more teeth than White or Hispanic Americans. The differences are especially pronounced in regard to retaining all of natural teeth. For adults under age 65, over 60% of Whites retained all teeth while 44% of African Americans and 39% of Native Americans kept all of natural teeth. (Figure 5a). For older adults differences in tooth loss by race/ethnicity grew larger. Compared to older Whites, significantly more African Americans and Native Americans lost all teeth (19% vs. 34% & 36%, respectively). (Figure 5b).

**Figure 5a. Percent of Adults with Tooth Loss by Income and by Number of Teeth Removed, Ages 18-64, NC BRFSS 2006, 2008, & 2010 Combined**

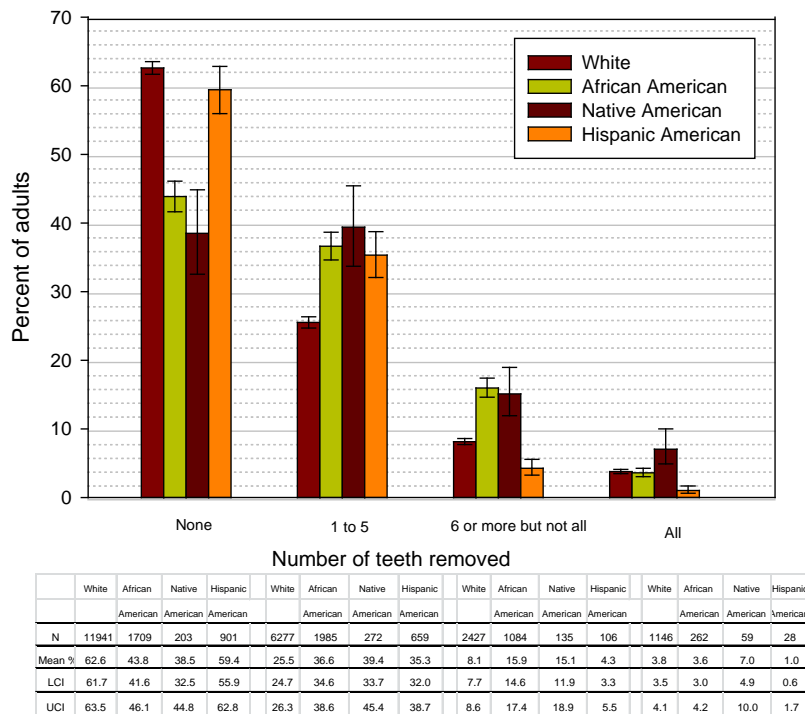
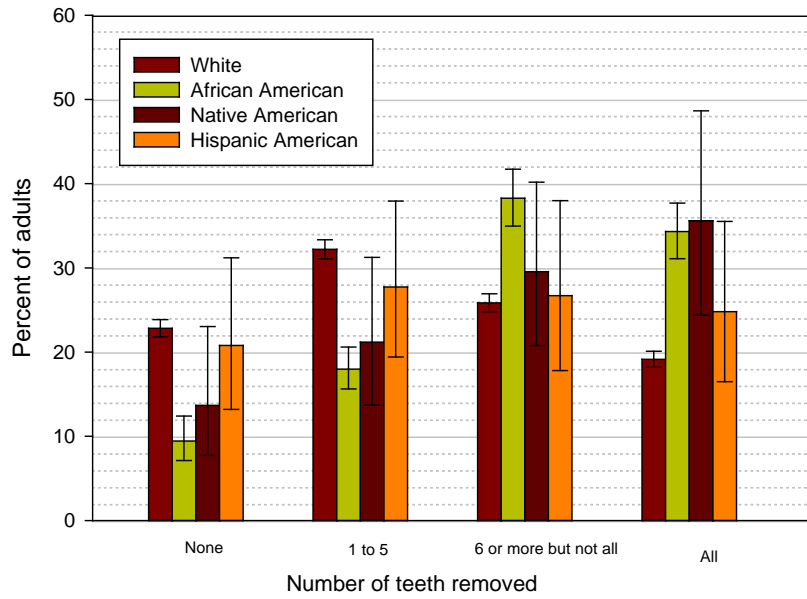


Figure 6b. Percent of Adults with Tooth Loss by Income and by Number of Teeth Removed, Ages 18-64, NC BRFSS 2006, 2008, & 2010 Combined



	White	African	Native	Hispanic	White	African	Native	Hispanic	White	African	Native	Hispanic	White	African	Native	Hispanic
	American	American	American	American	American	American	American	American	American	American	American	American	American	American	American	American
N	2269	129	21	31	3277	318	40	42	2731	590	64	42	2120	519	59	42
Mean %	22.8	9.4	13.7	20.8	32.2	18.0	21.2	27.7	25.8	38.3	29.6	26.7	19.1	34.3	35.6	24.8
LCI	21.8	7.1	7.7	13.2	31.1	15.6	13.7	19.4	24.8	35.0	20.8	17.8	18.2	31.1	24.4	16.5
UCI	23.9	12.4	23.0	31.2	33.3	20.6	31.2	37.9	26.9	41.7	40.2	38.0	20.1	37.7	48.6	35.5

## Part 2. Health variables related to tooth loss

In this part, the relationships between tooth loss and health related variables are investigated. Health related variables include general health, diabetes, heart diseases/heart attack, stroke, BMI, disability, physically and mentally healthy days, sleep, and lack of health plans.

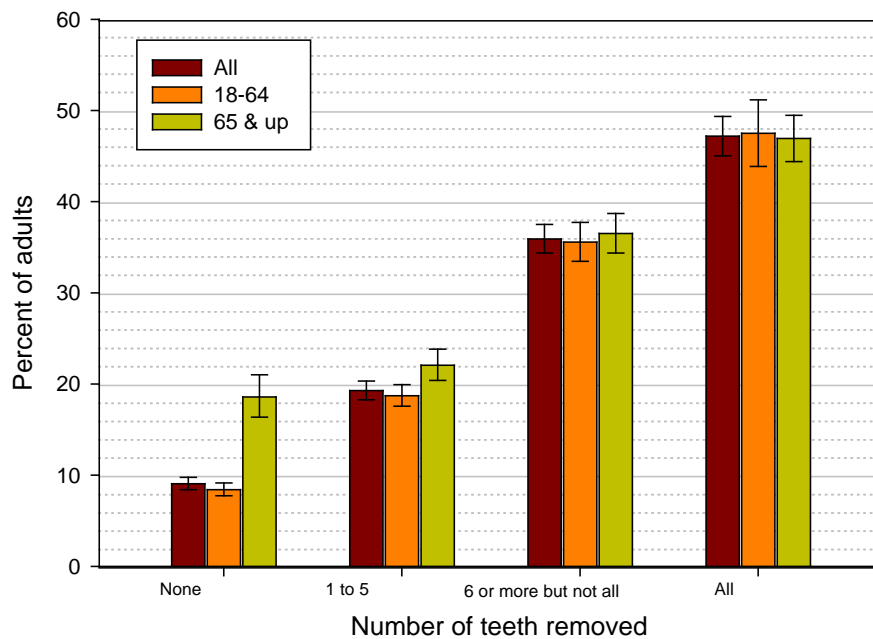
### 1. General health

Survey respondents were asked to self-rate the condition of their health as excellent, good, fair, or poor. The relationship between tooth loss and self-rated quality of health was examined. Losing any number of teeth is strongly related to perceived fair-poor general health, especially among adults under 65 years old.

Close to 20% of those adults under 65 who lost 1 to 5 teeth reported poor-fair health as compared to 8% of those who retained all their natural teeth. The percent of people who reported fair-poor health jumps to 36% for those who lost 6 or more teeth, and 48% for those who had lost all natural teeth.

About 20% of older adults who had all natural teeth reported having fair-poor health, more than twice the percentage of younger adults who had all the natural teeth. However, the percentage of those reporting fair-poor health was very similar between the two age groups for those who lost 6 or more teeth. (Figure 6).

**Figure 7. Percent of Adults Who Report Their Health to be Fair or Poor by Age and Number of Teeth Removed, NC BRFSS 2006, 2008, & 2010 Combined**

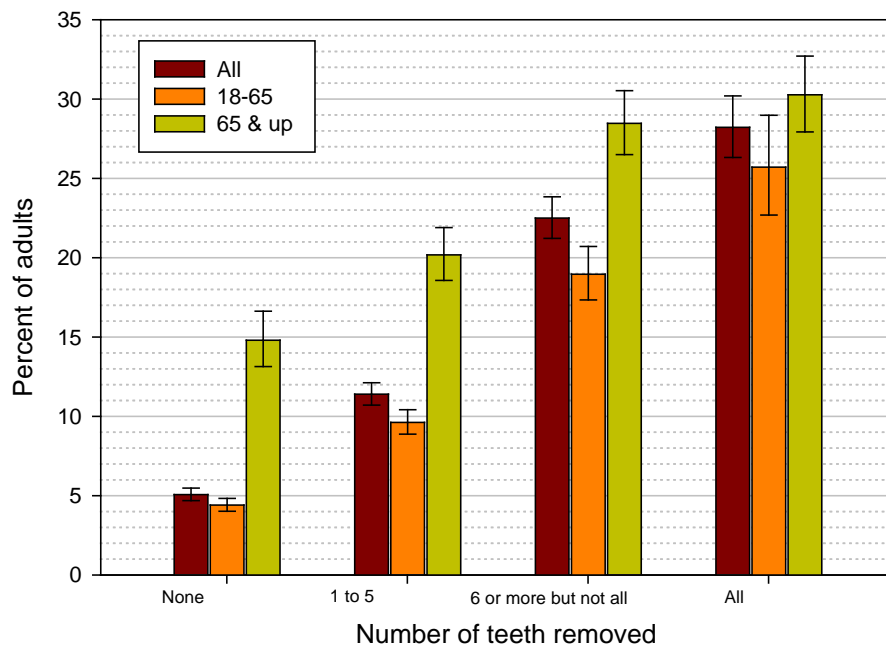


	All	18-64	65+	All	18-64	65+	All	18-64	65+	All	18-64	65+
N	1772	1327	445	2612	1774	838	2682	1428	1254	1997	737	1260
Mean %	9.1	8.4	18.6	19.3	18.7	22.1	35.9	35.6	36.5	47.2	47.5	46.9
LCI	8.4	7.7	16.4	18.3	17.6	20.4	34.4	33.5	34.4	45.0	43.9	44.4
UCI	9.8	9.1	21.0	20.3	19.9	23.8	37.5	37.7	38.7	49.3	51.2	49.5

## 2. Diabetes:

Retention of natural teeth and occurrence of diabetes are significantly related. For adults over 65 years old who had lost all of their natural teeth, the prevalence of diabetes is twice that of those who retained all of their teeth (14.8% vs. 30.3%). For the younger age group, the effect of tooth loss is even greater: 25% of those who had lost all of their natural teeth had diabetes, a six fold increase over those who retained all of their teeth (4.4%). (Figure 7).

**Figure 8. Percent of Adults Who Report That They Have Diabetes by Age and Number of Teeth Removed, NC BRFSS 2006, 2008, & 2010 Combined**



	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up
N	1279	890	389	1831	1109	722	1747	784	963	1189	399	790
Mean %	5.1	4.4	14.8	11.4	9.6	20.2	22.5	19.0	28.5	28.2	25.7	30.3
LCI	4.7	4.0	13.1	10.7	8.9	18.6	21.2	17.3	26.5	26.3	22.7	27.9
UCI	5.5	4.8	16.6	12.1	10.4	21.9	23.8	20.7	30.5	30.2	29.0	32.7

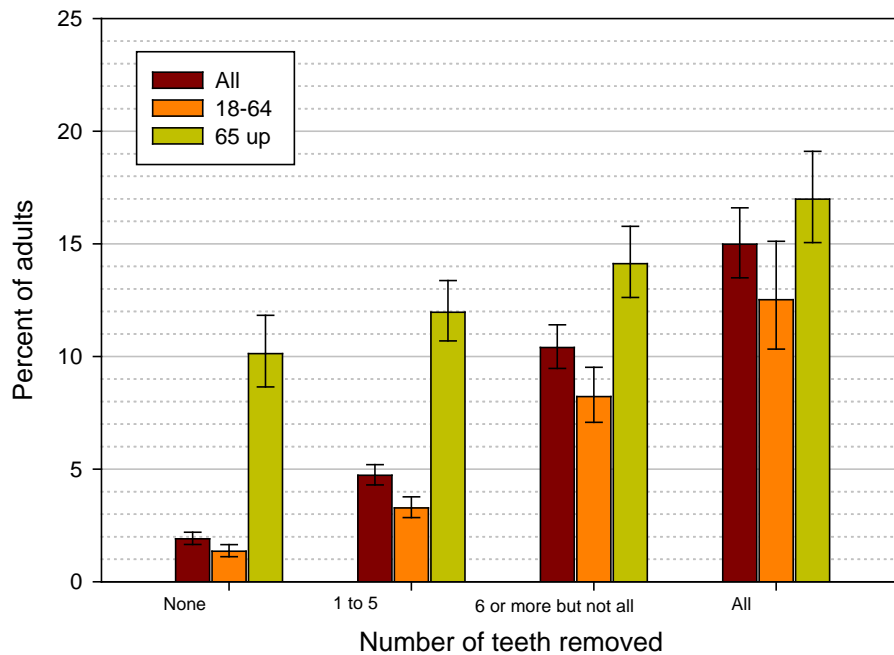


### 3. Heart disease

Prevalence of heart disease is also strongly related to tooth loss. Seventeen percent of the older adults who lost all of their natural teeth also reported having heart disease, which is 1.7 times higher than those who retained all of their natural teeth (10.1%). The effect of edentulism, losing all natural teeth, is even greater for the younger group. Younger adults who lost all of their natural teeth had heart disease had 9 times higher heart disease prevalence of those who retained all of their natural teeth (12.5% vs. 1.4%, respectively). (Figure 8).

Tooth loss is also significantly related to occurrence of heart attack. The occurrence of heart attack gradually increases with tooth loss. Those who had lost 6 or more teeth had a much higher risk of heart attack. This effect is especially greater for those younger than age 65. The percent of those who had a heart attack increases 2.6 times for those who had lost 6 or more teeth but not all when compared with those who had lost 1-6 teeth (3.1% vs. 8.6%) and 4.1% for those who had lost all teeth (12.8%). (Figure not shown).

**Figure 9. Percent of Adults Who Have Heart Disease by Age and Number of Teeth Removed, NC BRFSS 2006, 2008, & 2010 Combined**

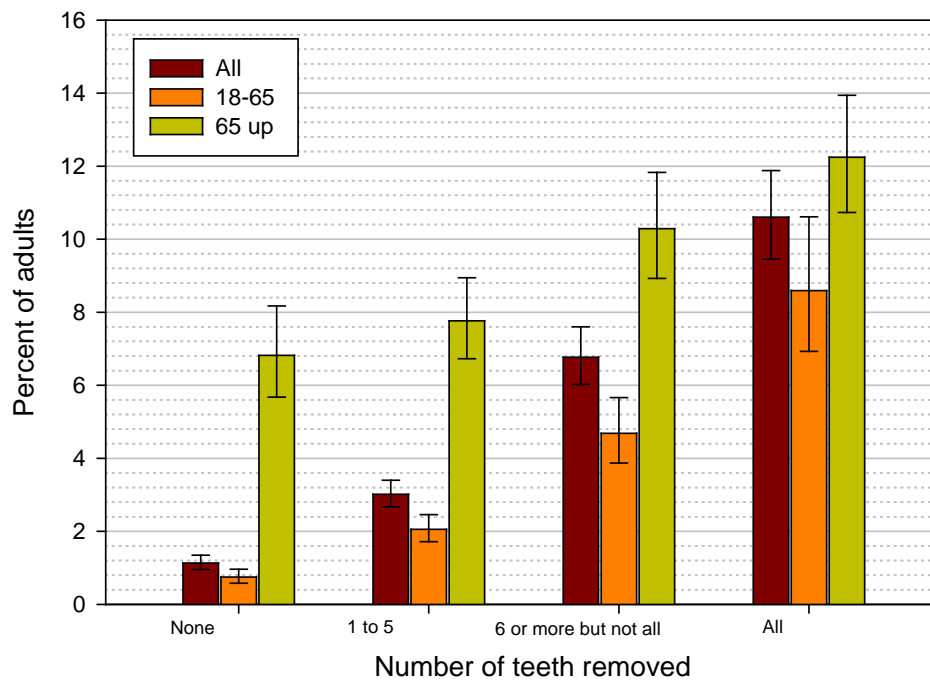


	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up
N	500	259	241	786	369	417	788	311	477	633	189	444
Mean %	1.9	1.4	10.1	4.7	3.3	12.0	10.4	8.2	14.1	15.0	12.5	17.0
LCI	1.7	1.1	8.6	4.3	2.8	10.7	9.5	7.1	12.6	13.5	10.3	15.1
UCI	2.2	1.6	11.8	5.2	3.8	13.4	11.4	9.5	15.8	16.6	15.1	19.1

### 4. Stroke

Tooth loss is strongly associated with incidence of stroke. The percent of older adults who report having a stroke increased as the number of teeth removed increases. Older adults who lost all of their natural teeth were 1.8 times more likely to report having a stroke compared to those who retained all of their teeth (12.2% vs. 6.8%, respectively). For the younger group, the effect of losing teeth is even greater. Nine percent of adults who lost all teeth had a stroke as compared to less than one percent of those who retained all teeth. (Figure 9).

**Figure 10. Percent of Adults Who Had a Stroke by Age and Number of Teeth Removed, NC BRFSS 2006, 2008, & 2010 Combined**

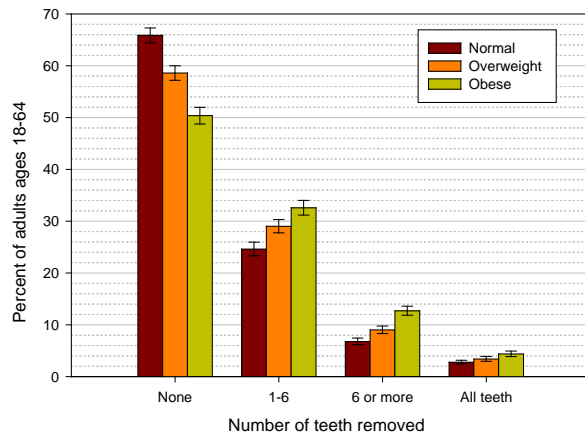


	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up
N	328	165	163	521	237	284	533	204	329	490	146	344
Mean %	1.1	0.7	6.8	3.0	2.1	7.8	6.8	4.7	10.3	10.6	8.6	12.2
LCI	1.0	0.6	5.7	2.7	1.7	6.7	6.0	3.9	8.9	9.5	6.9	10.7
UCI	1.3	1.0	8.2	3.4	2.5	8.9	7.6	5.7	11.8	11.9	10.6	13.9

**5. BMI:**

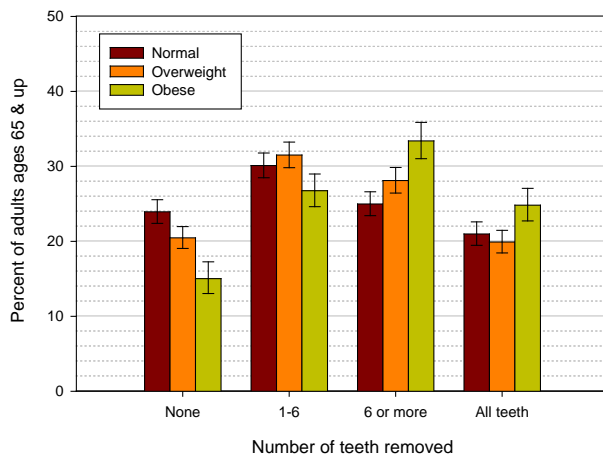
Tooth loss is also related to BMI. The percent of those who retained all of their natural teeth is highest among those whose weight is normal: 65.9% for younger adults and 23.9% for older adults with normal weight compared to 50.4% of younger adults and 15.0% of older adults who were obese retained all teeth. Higher percent of younger adults who were obese lost any number of teeth while older adults who were obese were more likely to have lost 6 or more teeth than those with normal weight. (Figure 10a & 10b).

**Figure 11a. Percent of Adults with Tooth Loss Who Are Normal Weight, Overweight, or Obese, Ages 18-64, NC BRFSS 2006, 2008, & 2010 Combined**



	Over-			Over-			Over-			Over-		
	Normal weight	Obese		Normal weight	Obese		Normal weight	Obese		Normal weight	Obese	
N	5621	5159	3703	2547	3283	3136	937	1225	1521	422	479	553
Mean %	65.9	58.6	50.4	24.6	29.0	32.6	6.8	9.0	12.7	2.8	3.4	4.4
LCI	64.4	57.2	48.8	23.3	27.7	31.2	6.2	8.3	11.9	2.4	3.0	3.9
UCI	67.3	60.0	52.0	26.0	30.3	34.0	7.4	9.7	13.6	3.1	3.9	4.9

**Figure 10b. Percent of Adults with Tooth Loss Who Are Normal Weight, Overweight, or Obese, Ages 65 or older, NC BRFSS 2006, 2008, & 2010 Combined**

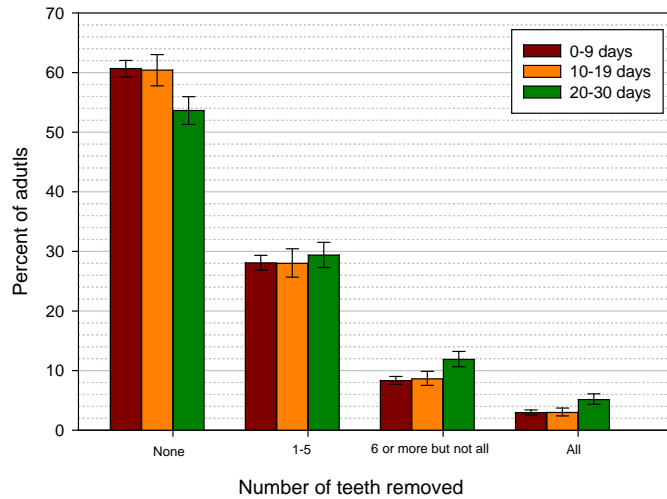


	Over-			Over-			Over-			Over-		
	Normal weight	Obese		Normal weight	Obese		Normal weight	Obese		Normal weight	Obese	
N	1053	958	375	1411	1468	744	1154	1300	916	944	1010	693
Mean %	23.9	20.5	15.0	30.1	31.5	26.7	25.0	28.1	33.4	21.0	19.9	24.8
LCI	22.4	19.0	13.0	28.5	29.8	24.6	23.4	26.4	31.0	19.5	18.5	22.7
UCI	25.5	22.0	17.3	31.8	33.2	29.0	26.6	29.9	35.9	22.6	21.5	27.1

## 6. Sleep

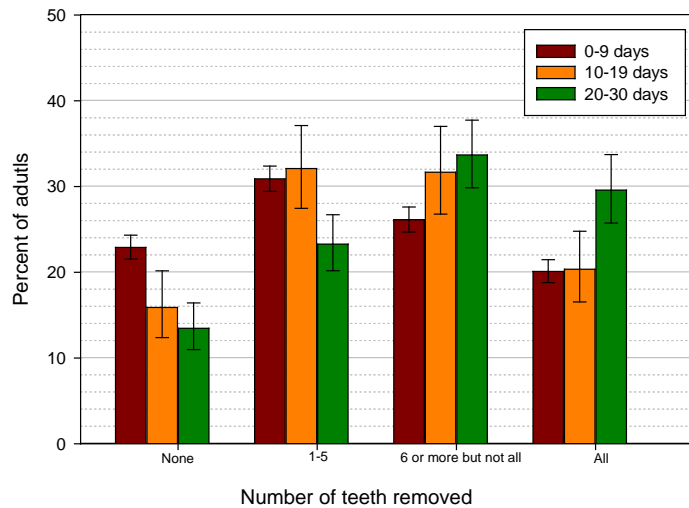
Figures 11a and 11b show the relationship between tooth loss and insufficient sleep. Those who lost more teeth reported more days of insufficient sleep and the relationship was stronger among the elderly. For the older group, 14% of those who had all of their natural teeth reported 20-30 days of insufficient sleep as opposed to 30% of those who lost all of their natural teeth.

**Figure 12a. Percent of Adults with Tooth Loss by Number of Days Not Getting Enough Rest or Sleep, Ages 18-64, NC BRFSS 2008 & 2010 Combined**



	0-9	10-19	20-30	0-9	10-19	20-30	0-9	10-19	20-30	0-9	10-19	20-30
N	5953	1594	1863	3591	915	1294	1284	384	677	501	140	283
Mean %	60.7	60.4	53.6	28.1	28.0	29.4	8.3	8.6	11.9	3.0	3.0	5.1
LCI	59.3	57.8	51.3	26.8	25.7	27.3	7.7	7.5	10.7	2.6	2.4	4.3
UCI	62.0	63.0	56.0	29.3	30.4	31.5	9.0	9.9	13.2	3.4	3.7	6.1

**Figure 11b. Percent of Adults with Tooth Loss by Number of Days Not Getting Enough Rest or Sleep, Ages 65 and up, NC BRFSS 2008 & 2010 Combined**

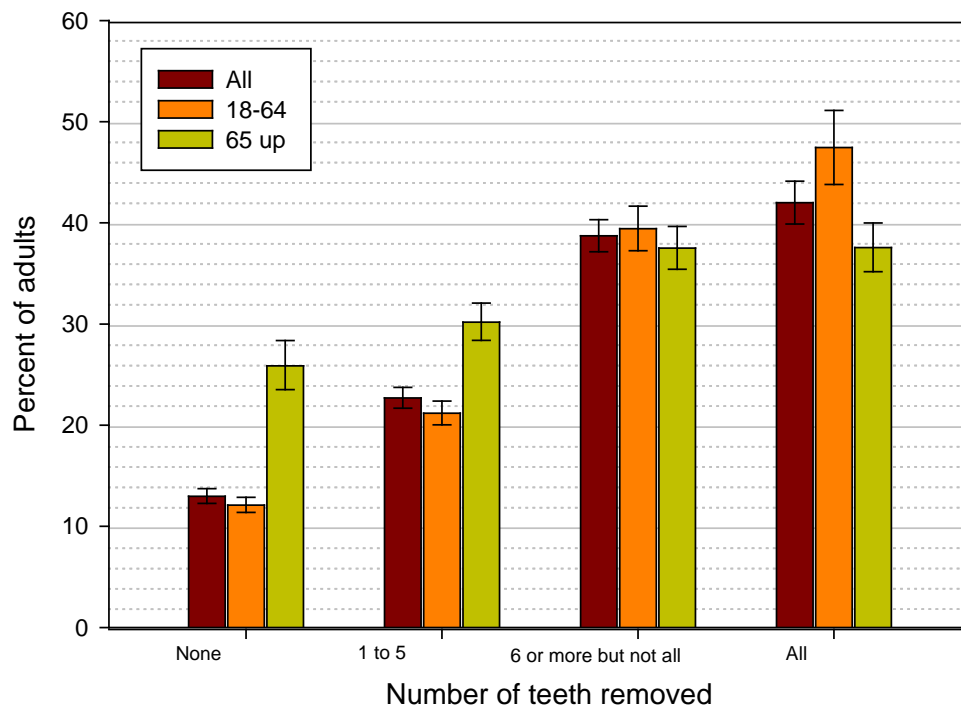


	0-9	10-19	20-30	0-9	10-19	20-30	0-9	10-19	20-30	0-9	10-19	20-30
N	1484	95	138	2028	204	240	1699	195	309	1346	139	275
Mean %	22.9	15.9	13.5	30.9	32.1	23.3	26.1	31.7	33.7	20.1	20.3	29.6
LCI	21.5	12.4	11.0	29.4	27.5	20.2	24.7	26.8	29.8	18.8	16.5	25.7
UCI	24.3	20.2	16.4	32.4	37.1	26.7	27.6	37.0	37.7	21.5	24.8	33.7

### 7. Disability: Activities limited physically and mentally

Tooth loss was associated to physical and mental disability. Those who reported greater tooth loss also report limitation upon their physical and mental activities. The effect of tooth loss on activities is more prominent among the younger age group. Compared to those who retained all of their teeth, those who had lost 1-5 teeth were 1.8 times more likely to report physical and mental disabilities (12.1% vs. 21.2%, respectively) and those who had lost 6 or more but not all and those who had lost all of their teeth reported 3.3 times and 3.9 times more likely to report their limitation (39.4% and 47.4% respectively). (Figure 12).

**Figure 13. Percent of Adults with Tooth Loss Whose Activities Are Limited Physically and Mentally by Age, NC BRFS 2006, 2008, & 2010 Combined**

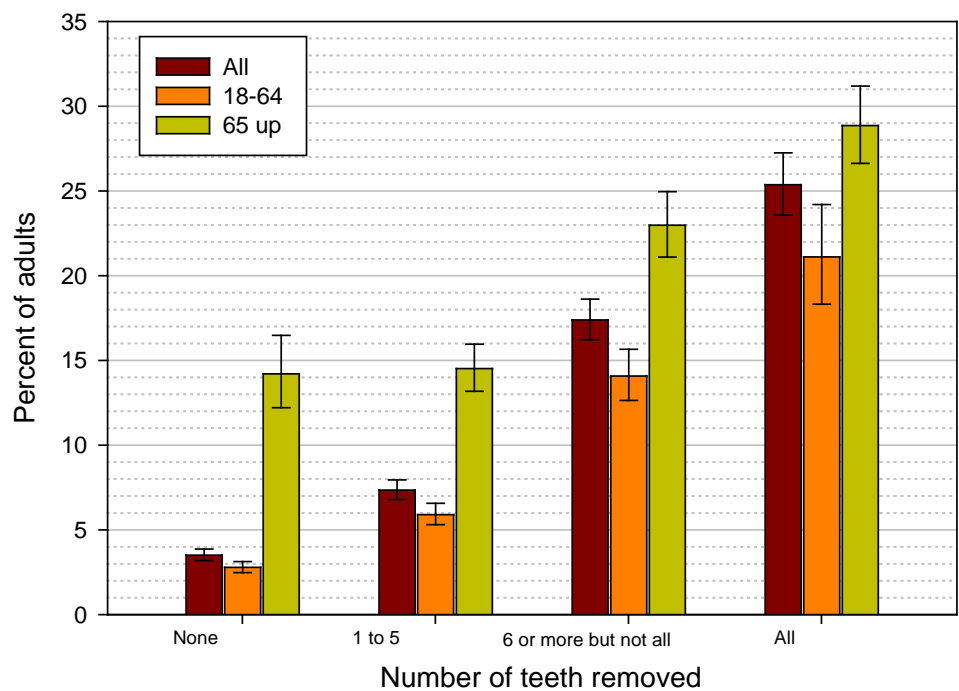


	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up
N	2877	2237	640	3413	2259	1154	2960	1615	1345	1819	746	1073
Mean %	13.0	12.1	25.9	22.7	21.2	30.2	38.7	39.4	37.5	42.0	47.4	37.5
LCI	12.3	11.4	23.5	21.7	20.0	28.4	37.1	37.3	35.4	39.9	43.8	35.2
UCI	13.7	12.9	28.4	23.7	22.4	32.1	40.3	41.6	39.6	44.1	51.1	40.0

### 8. Health problems requiring special equipment

There are strong associations between the number of teeth removed and the percent of the people who answered yes to the question: “Do you have any health problem that require you to use special equipment such as a cane, a wheelchair, a special bed or a special telephone (including occasional use or use in certain circumstances).” This effect is particularly apparent for the younger age group: when compared to those who had all of their teeth, those who lost all teeth had 7 times higher rate of having disability that requires special equipment (2.8% vs. 21.1%, respectively). (Figure 13).

**Figure 14. Percent of Adults with Tooth Loss Who Have Health Problems Requiring Special Equipment by Age, NC BRFSS 2006, 2008, & 2010 Combined**

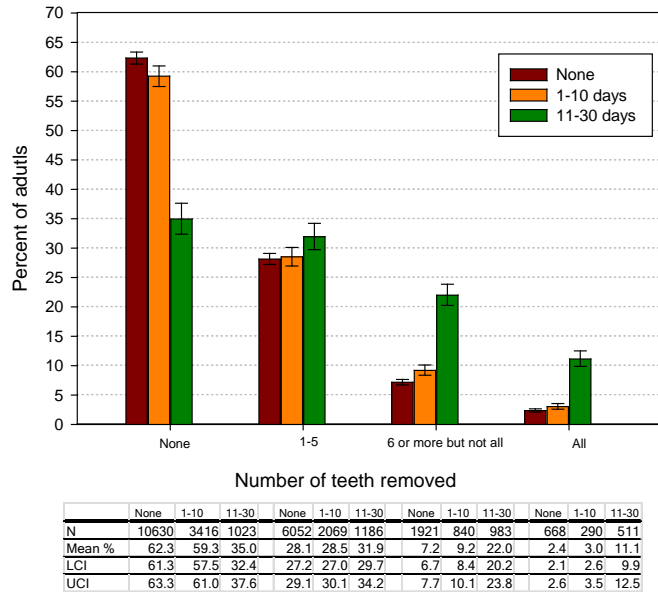


	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up	All	18-65	65 up
N	931	582	349	1228	661	567	1393	600	793	1136	339	797
Mean %	3.5	2.8	14.2	7.3	5.9	14.5	17.4	14.1	23.0	25.4	21.1	28.9
LCI	3.2	2.5	12.2	6.8	5.3	13.2	16.2	12.6	21.1	23.6	18.3	26.6
UCI	3.9	3.1	16.5	7.9	6.6	16.0	18.6	15.7	25.0	27.2	24.2	31.2

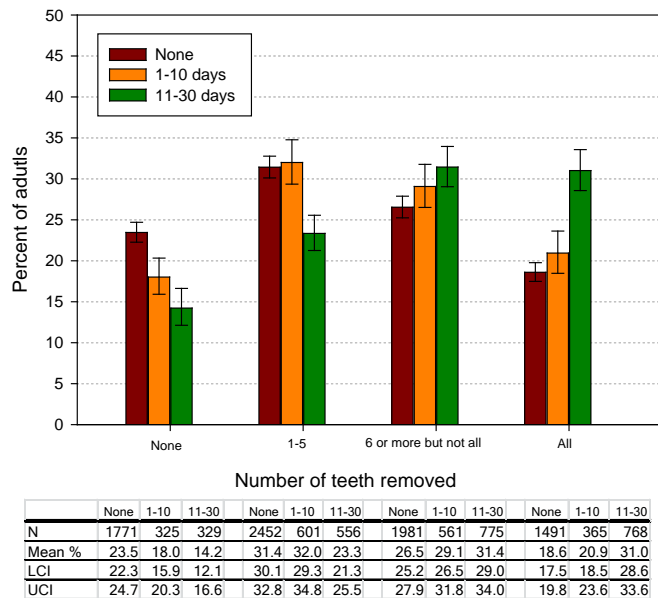
### 9. Physically healthy days

Figures 14a and 14b show the relationship between physical health and tooth loss. For younger adults, those who kept all of their teeth reported more physically healthy days compared to those who lost 6 or more teeth. For older adults, those who lost 6 or more teeth reported more unhealthy days than those who lost fewer teeth.

**Figure 15a. Percent of Adults with Tooth Loss by Number of Days When Their Physical Health Was Not Good, Ages 18-64, NC BRFSS 2006, 2008, & 2010**



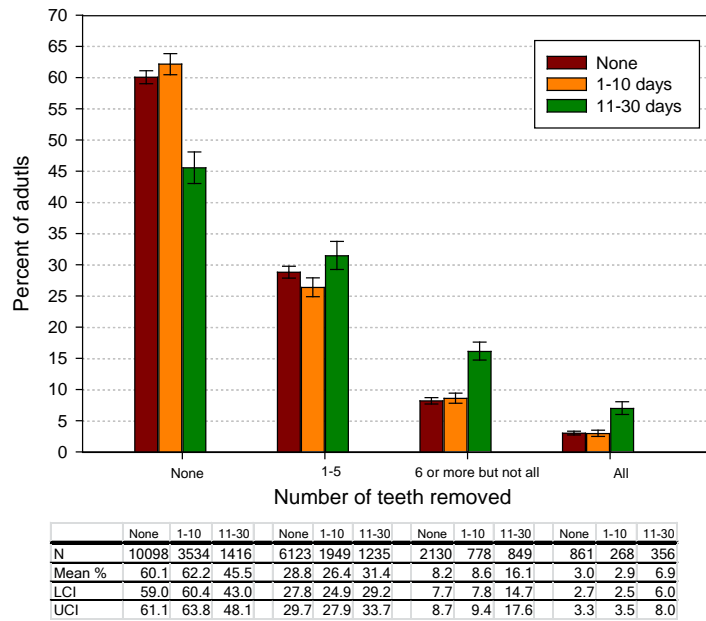
**Figure 14b. Percent of Adults with Tooth Loss by Number of Days When Their Physical Health Was Not Good, Ages 65 & Up, NC BRFSS 2006, 2008, & 2010**



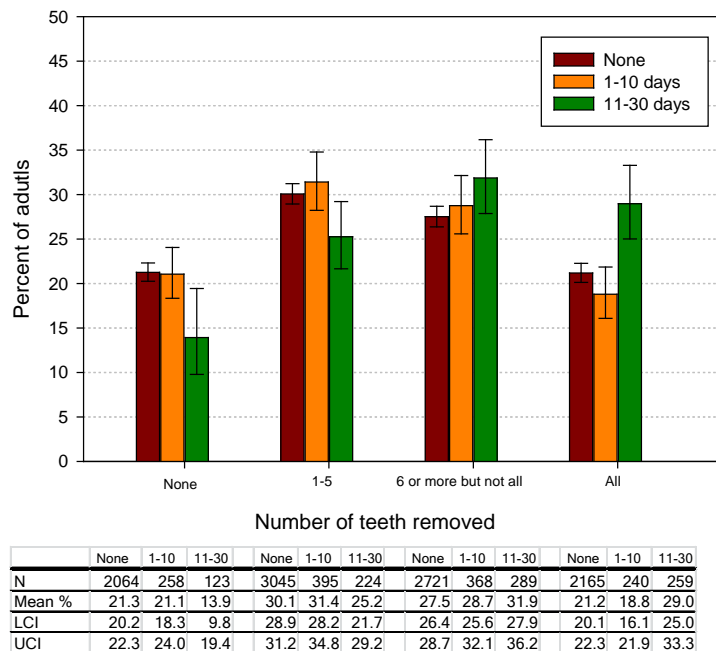
### 10. Mentally healthy days

Figures 15a and 15b show the relationship between tooth loss and mentally healthy days. In general those people who lost fewer teeth had more mentally healthy days. The relationship between tooth loss and mental health was stronger for the younger group than for the older one.

**Figure 16a. Percent of Adults with Tooth Loss by Number of Days When Mental Health Was Not Good, Ages 18-64, NC BRFSS 2006, 2008, & 2010**



**Figure 15b. Percent of Adults with Tooth Loss by Number of Days When Mental Health Was Not Good, Ages 18-64, NC BRFSS 2006, 2008, & 2010**





### Part 3. Healthy life styles related to tooth loss

In this part, the relationships among tooth loss and health are examined relation to healthy life styles, such as smoking, drinking, exercise and emotional support.

#### 1. Smoking

Studies consistently show smoking has detrimental effects on retention of natural teeth. Daily smokers lost more teeth than non-smokers or those who were occasional or former smokers. In this study, among the adults ages 18-64, 68% of those who never smoked retained their natural teeth compared to 42% of daily smokers. For both age groups, significantly more adults who smoked lost all the teeth when compared to those who never smoked.

Figure 17a. Percent of Adults with Tooth Loss by Smoking Status, Ages 18- 64, NC BRFSS 2006, 2008 & 2010 Combined

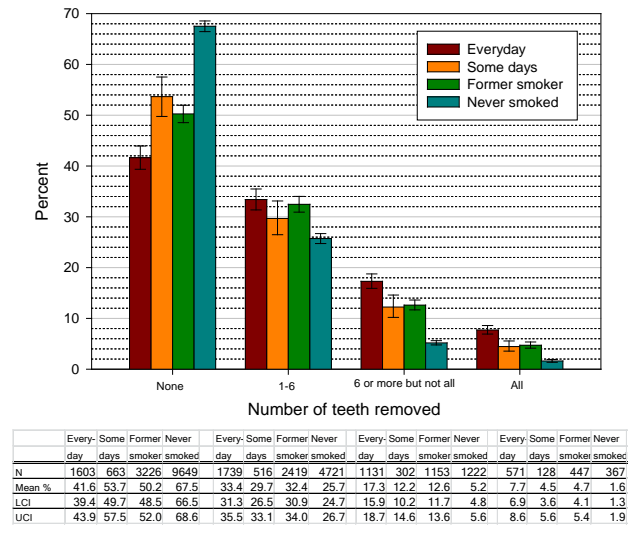
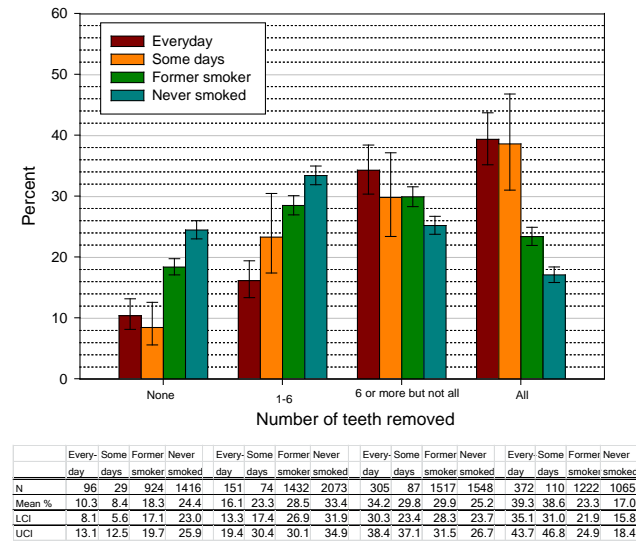


Figure 16b. Percent of Adults with Tooth Loss by Smoking Status, Ages 65 and up, NC BRFSS 2006, 2008 & 2010 Combined

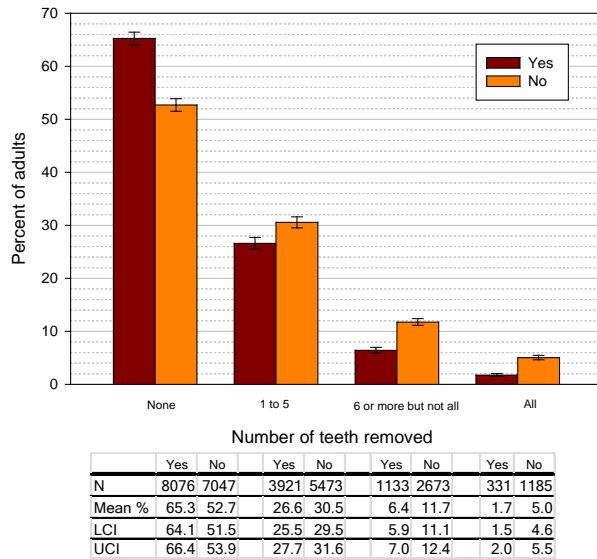


## 2. Drinking

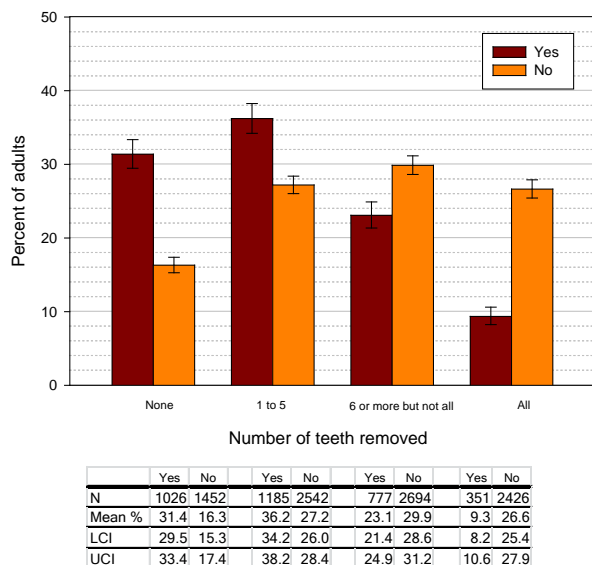
The relationships between number of teeth lost and drinking any amount (Figures 18a & 18b), binge drinking (Figures 19a & 19b) and heavy drinking (Figures 17a & 17b) are shown below. Generally, those people who did not drink any in the past month showed more teeth lost for both younger and older groups, which is a puzzling finding different from an expectation that alcohol adversely affect oral health.

### Drink any amount

**Figure 18a. Percent of Adults with Tooth Loss Who Had At Least One Drink of Any Alcoholic Beverage during the Past Month, Ages 16-64, NC BRFS 2006, 2008, & 2010 Combined**

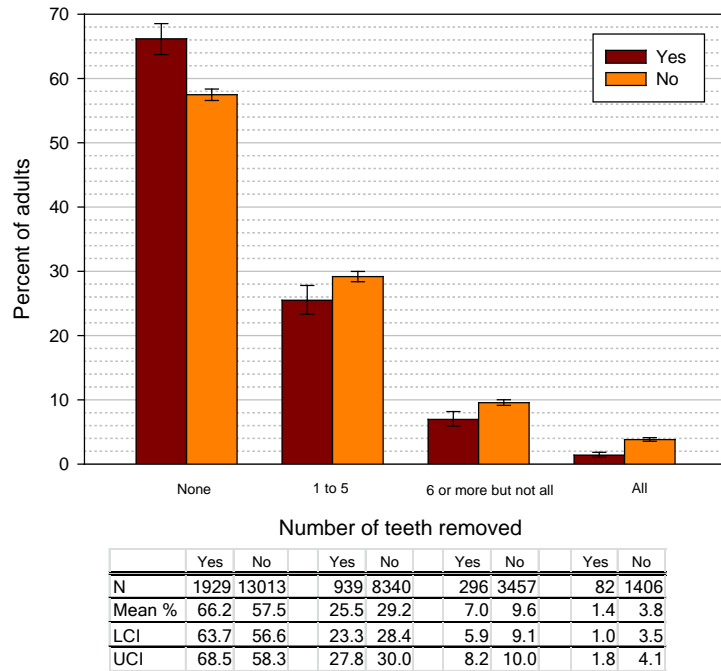


**Figure 17b. Percent of Adults with Tooth Loss Who Had At Least One Drink of Any Alcoholic Beverage during the Past Month, Ages 65 and up, NC BRFS 2006, 2008, & 2010 Combined**

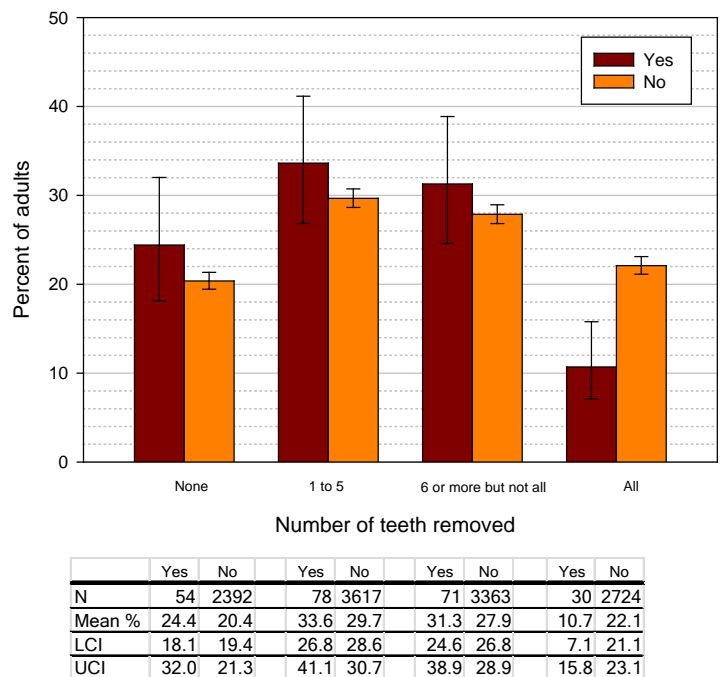


### Binge drinking

**Figure 19a. Percent of Adult Binge Drinkers (Men Having Five or More Drinks/Women Having Four or More on One Occasion) with Tooth Loss, Ages 16-64, NC BRFSS 2006, 2008, & 2010 Combined**

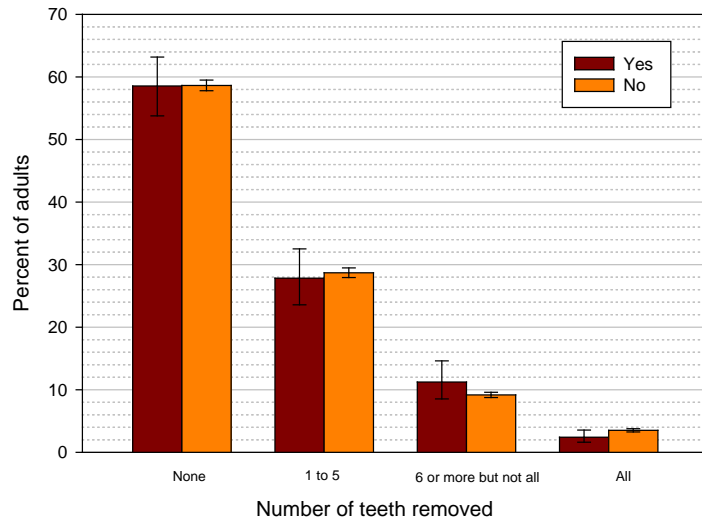


**Figure 18b. Percent of Adult Binge Drinkers (Men Having Five or More Drinks/Women Having Four or More on One Occasion) with Tooth Loss, Ages 65 and up, NC BRFSS 2006, 2008, & 2010 Combined**



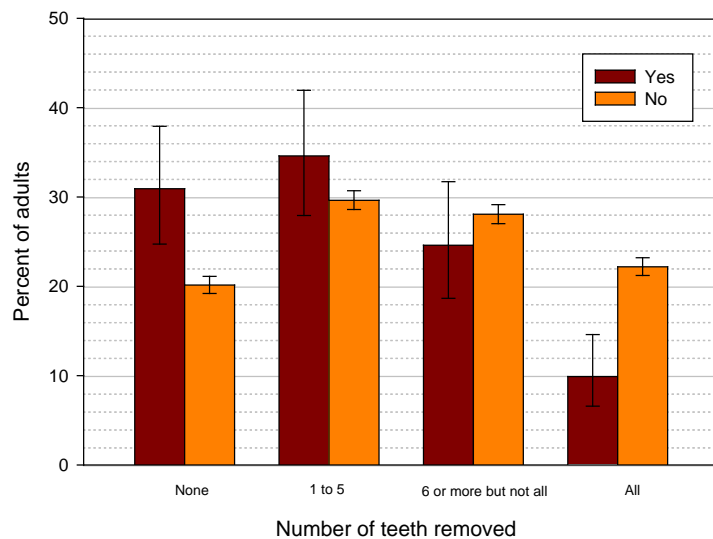
### Heavy drinking

**Figure 20a. Percent of Heavy Drinker (Men having More Than Two Drinks/Women Having More Than One Drink per Day, Ages 16-64, NC BRFSS 2006, 2008, & 2010 Combined**



	Yes	No	Yes	No	Yes	No	Yes	No
N	635	14265	343	8914	136	3604	45	1445
Mean %	58.5	58.6	27.8	28.7	11.2	9.2	2.4	3.5
LCI	53.8	57.8	23.6	27.9	8.5	8.7	1.6	3.3
UCI	63.2	59.5	32.5	29.5	14.6	9.6	3.5	3.8

**Figure 19b. Percent of Heavy Drinker (Men having More Than Two Drinks/ Women Having More Than One Drink per Day, Ages 65 and up, NC BRFSS 2006, 2008, & 2010 Combined**

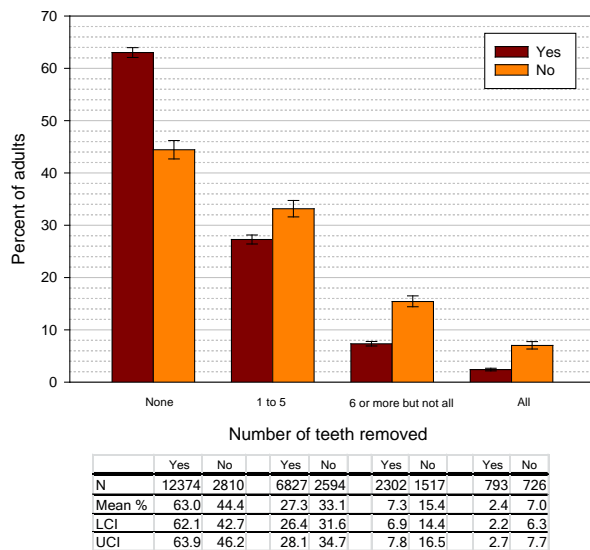


	Yes	No	Yes	No	Yes	No	Yes	No
N	78	2345	87	3591	63	3347	33	2716
Mean %	30.9	20.1	34.6	29.6	24.6	28.1	9.9	22.2
LCI	24.7	19.2	27.9	28.6	18.6	27.0	6.6	21.2
UCI	37.9	21.1	41.9	30.7	31.7	29.1	14.6	23.2

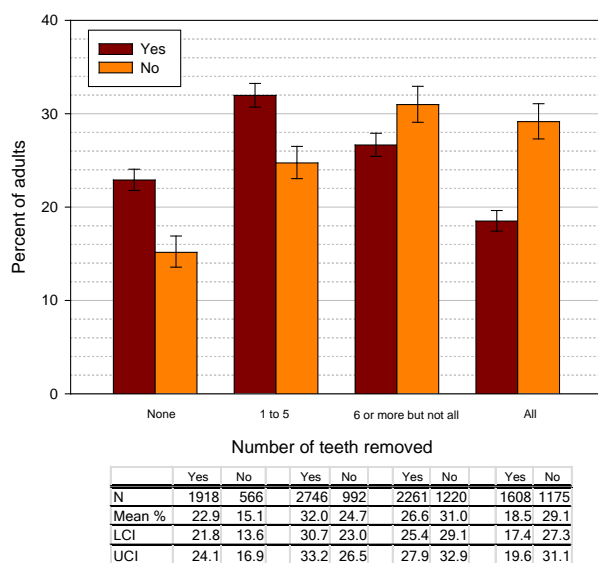
### 3. Exercise

Healthy life style choices, including regular exercise, seem to be related to number of teeth lost. More adults who participated in any type of exercise retained all of their natural teeth than those who did not participate in exercise (63.0% vs 44.4% for younger adults; 22.9% vs. 15.1% for older adults, respectively). Adults who lost all of their teeth were less like to participate in any type of exercise.

**Figure 21a. Percent of Adults with Tooth Loss by Physical Activities or Exercises in the Past Month, Ages 18-64, NC BRFSS 2006, 2008, & 2010 Combined**



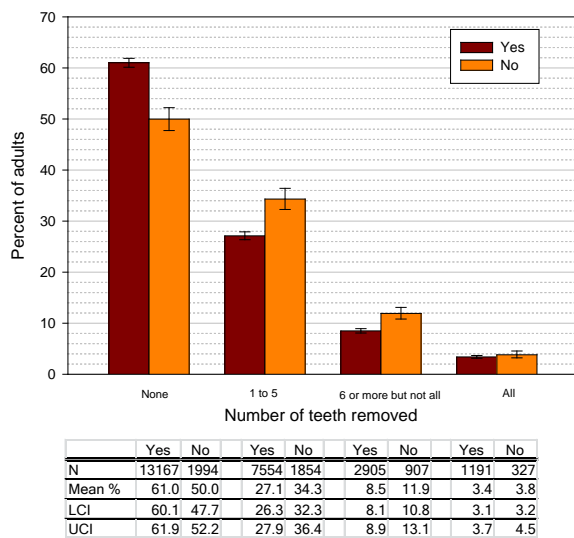
**Figure 20b. Percent of Adults with Tooth Loss by Physical Activities or Exercises in the Past Month, Ages 65 and up, NC BRFSS 2006, 2008, & 2010 Combined**



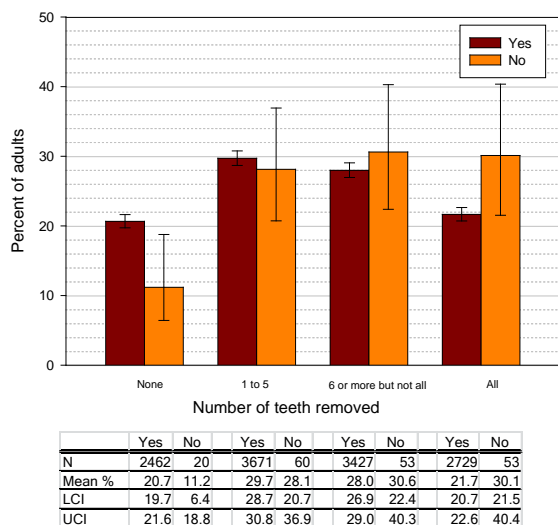
### 4. Health insurance

Having dental insurance was associated with retention of natural teeth. Health insurance does not necessarily include dental insurance, but those who have health insurance would be more likely to have dental insurance than those without health insurance. Figure 21a and 21b show a comparatively strong relationship between having health insurance and number of teeth lost among the young, but a weaker relationship among older group. For those, ages 18-64, 61% of those who had health insurance had all of their natural teeth compared to 50% of those who were uninsured. Adults without health insurance lost more teeth than those with health insurance. However, for those who lost all teeth, having health insurance exhibited little effects.

**Figure 22a. Percent of Adults with Tooth Loss Who have Health Care Coverage, Ages, 18-64 NC BRFS 2006, 2008, & 2010 Combined**



**Figure 21b. Percent of Adults with Tooth Loss Who have Health Care Coverage, Ages, 65 and up, NC BRFS 2006, 2008, & 2010 Combined**

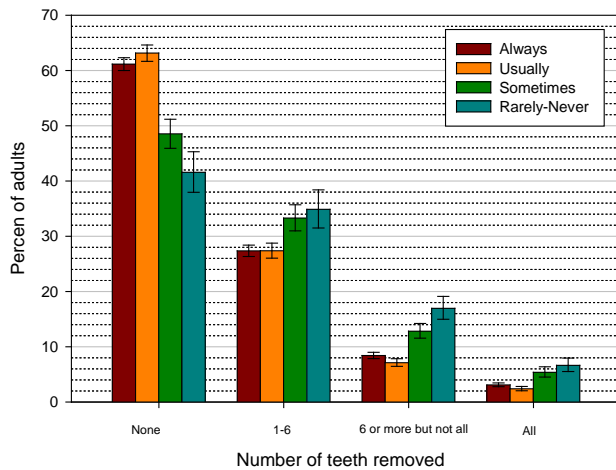


### 5. Emotional support

There is a rather strong association between number of teeth lost and emotional support. Those who had all natural teeth have more emotional support than those who lost all of teeth. (Figure 22a & 22b).

**Figure 23a. Percent of Adults with Tooth Loss by Social and Emotional Support, Ages 18- 64, Ages 18- 64, NC BRFSS 2006, 2008, & 2010 Combined**

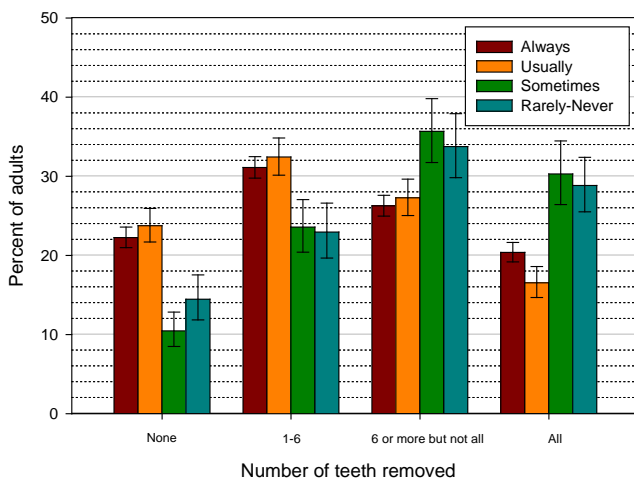
"How often do you get the social and emotional support you need?"



	Some- Rarely/				Some- Rarely/				Some- Rarely/				Some- Rarely/			
	Always	Usually	times	never	Always	Usually	times	never	Always	Usually	times	never	Always	Usually	times	never
N	7751	4842	1483	671	4564	2614	1257	702	1699	810	671	516	673	291	274	214
Mean %	61.2	63.1	48.5	41.6	27.3	27.4	33.3	34.9	8.4	7.1	12.8	16.9	3.1	2.4	5.4	6.6
LCI	60.0	61.6	45.9	37.9	26.3	26.0	31.0	31.5	7.9	6.4	11.5	15.0	2.8	2.0	4.5	5.5
UCI	62.3	64.6	51.2	45.3	28.4	28.7	35.7	38.4	9.0	7.8	14.2	19.1	3.5	2.8	6.4	8.0

**Figure 22b. Percent of Adults with Tooth Loss by Social and Emotional Support, Ages 65 and up, NC BRFSS 2006, 2008, & 2010 Combined**

"How often do you get the social and emotional support you need?"

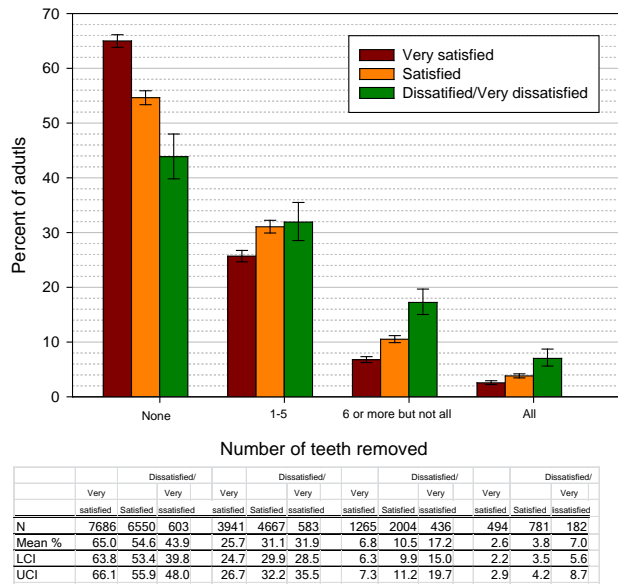


	Some- Rarely/				Some- Rarely/				Some- Rarely/				Some- Rarely/			
	Always	Usually	times	never	Always	Usually	times	never	Always	Usually	times	never	Always	Usually	times	never
N	1545	542	128	154	2296	746	255	252	1963	629	346	337	1532	396	292	351
Mean %	22.3	23.7	10.5	14.5	31.1	32.4	23.6	23.0	26.3	27.3	35.7	33.8	20.4	16.5	30.3	28.8
LCI	21.0	21.7	8.5	11.9	29.8	30.1	20.4	19.7	25.0	25.0	31.7	29.8	19.2	14.7	26.4	25.5
UCI	23.6	25.9	12.8	17.5	32.5	34.8	27.1	26.6	27.6	29.6	39.8	37.9	21.6	18.6	34.5	32.4

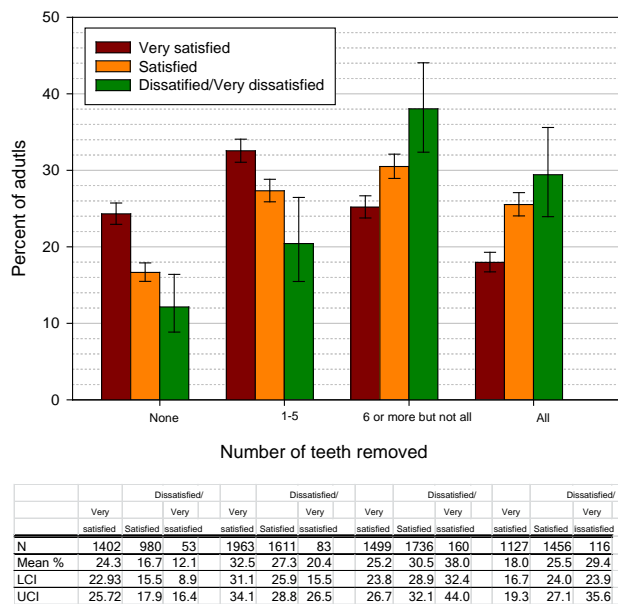
### 6. Life satisfaction

Life satisfaction is also associated to tooth loss. Younger adults who had all their natural teeth represented the highest percent of those reporting very satisfied. Older adults who lost fewer than 6 teeth were more likely to report being very satisfied than those who lost more teeth.

**Figure 24a. Percent of Adults with Tooth Loss by Life Satisfaction, Ages 18-64, NC BRFSS, 2008 & 2010**  
 "In general, how satisfied are you with your life?"



**Figure 23b. Percent of Adults with Tooth Loss by Life Satisfaction, Ages 65 and up, NC BRFSS, 2008 & 2010**  
 "In general, how satisfied are you with your life?"





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