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**Ten-Year Trends in Regional Disparities in Health Status and Health Risk
Factors in North Carolina by Region : Data from the Behavioral Risk Factor
Surveillance System, Years 2000-2009**

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**Ten-Year Trends in Regional Disparities in Health Status and Health Risk Factors in Eastern North Carolina by Region:
Data from the Behavioral Risk Factor Surveillance System, Years 2000-2009**

In 2000, Healthy People 2010 set goals for achieving healthier lives for all the people in the United States¹. This year, Healthy People 2020 launched new goals². One of the key goals is to eliminate or reduce regional disparities, so that people can live healthy lives regardless of where they live.

The purpose of this report is to examine trends in health and health risk factors over the past 10 years. Our particular focus is on regional disparities in health in Eastern North Carolina as compared to the rest of the state. Eastern North Carolina, the 41 counties of the coastal plain (those essentially east of Interstate 95), have lagged behind the rest of the state in mortality and health related measures when compared to the rest of the other 59 counties of the state³.

Analyses are conducted on data from the North Carolina Behavioral Risk Factor Surveillance System (BRFSS) survey to show yearly changes between 2000 and 2009 in health status and health risk factors, such as access to medical care, obesity, diabetes, hypertension, and smoking⁴. The North Carolina BRFSS, which is administered by the State Center for Health Statistics, is a random telephone survey of adults conducted annually in all counties of the state. Analyses in this report are performed using SUDAAN, a statistical software package used in research involving complex sampling designs (Research Triangle Institute [2002])⁵.

Yearly trends by regions are shown both for Eastern North Carolina vs. the rest of the state and also by three regions: Eastern, Piedmont, and Western North Carolina. While the size of the annual statewide BRFSS sample is large, sample sizes for each region for a single year may not be sufficient for valid comparisons. Confidence intervals (95%) are included in tables in this report as well as mean percentages.

The survey collects cross-sectional data: the respondents to the BRFSS survey are different each year. Thus, the yearly trends do not show longitudinal results; rather, the data provide a general picture of an overall trend across the 10 year period. As are shown from the ranges of confidence intervals in the tables, most observed yearly differences between regions are not significant ($p < 0.05$).

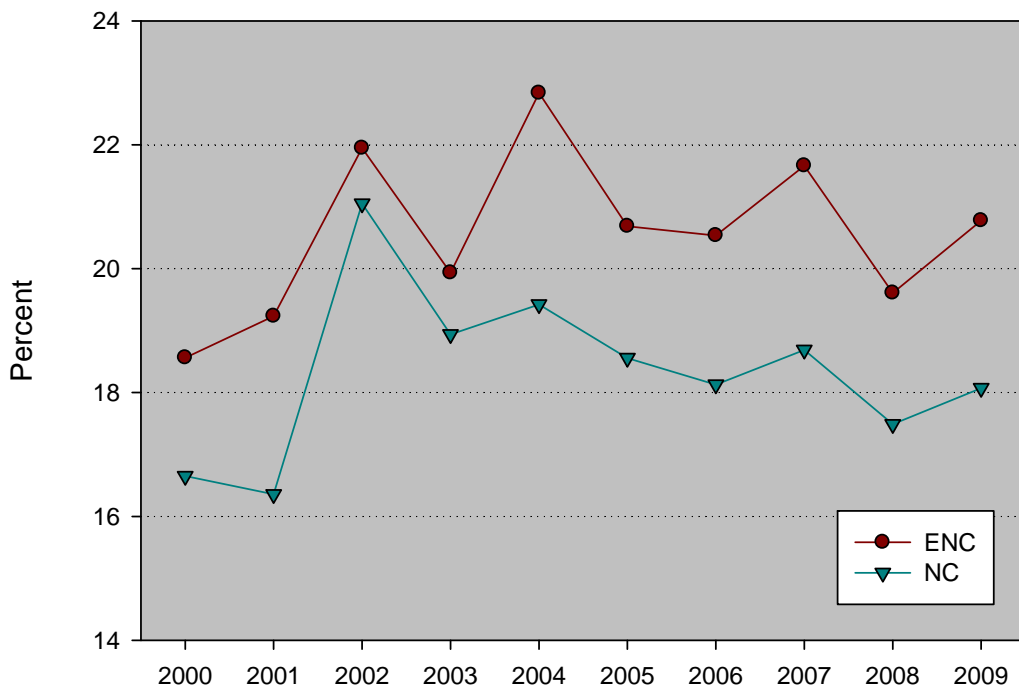
In addition to yearly trend analyses, this report includes regional comparisons for 5-year aggregated data from 2005 to 2009. When data are aggregated for 5 years, significant regional differences are more likely to be observed than for the single-year analyses.

Perceived Health Status

North Carolinians described their general health status by choosing one of the following responses: excellent, very good, good, fair, or poor.

Over the ten years, the trend for the percent of those who reported fair-to-poor health in Eastern North Carolina fluctuates, but stays around 20%, which is higher than North Carolina's average for all years (Figure 1-a). Regional differences show that Piedmont North Carolinians report fair-to-poor health less often than the rest of the state (Figure 1-b). When 5-year aggregated data are analyzed by region, the percent of people reporting fair-to-poor health in Eastern and Western North Carolina is significantly higher than in the Piedmont (Figure 1-c).

Figure 1-a. Trend for Percent of People Reporting Fair-to-Poor Health in Eastern North Carolina Compared to North Carolina, NC BRFSS 2000-2009



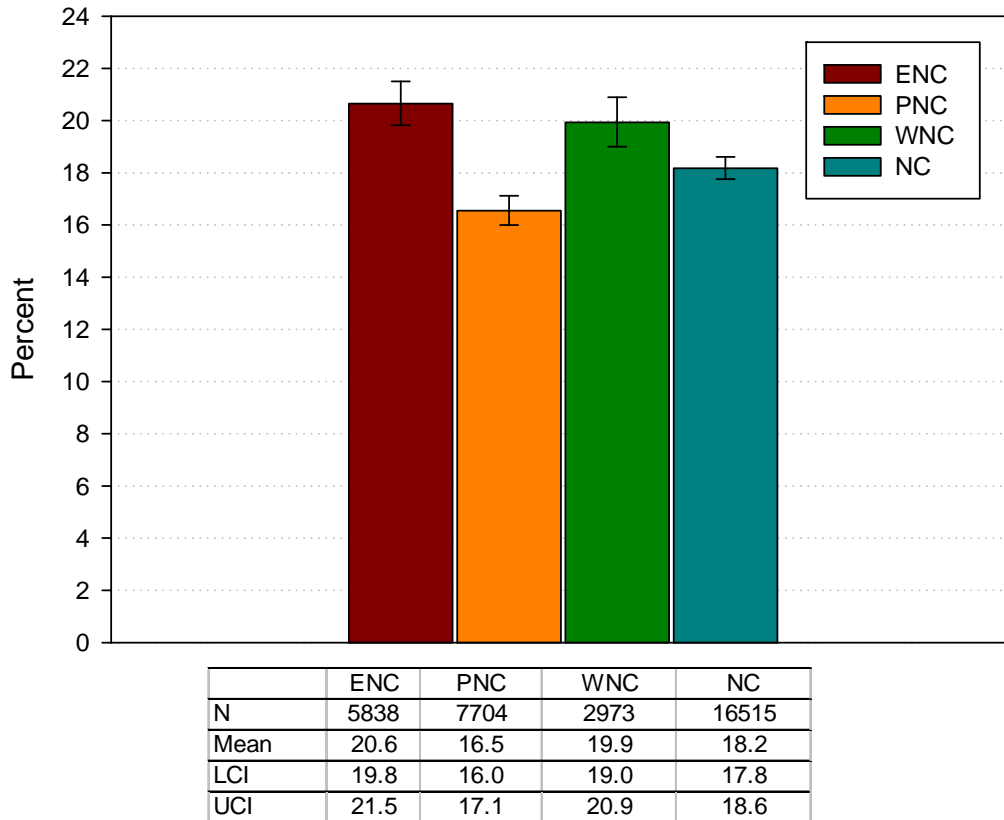
Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	177	327	431	822	1219	1308	1215	1201	1276	838
	Percent	18.6	19.2	21.9	19.9	22.8	20.7	20.5	21.7	19.6	20.8
	Up CI	22.0	23.7	24.6	23.3	25.3	23.2	22.7	23.3	21.5	25.4
	Low CI	15.6	15.5	19.5	17.0	20.6	18.4	18.5	20.1	17.8	16.8
NC	N	550	1047	1405	2067	3210	3700	3326	3341	3390	2758
	Percent	16.6	16.4	21.0	18.9	19.4	18.6	18.1	18.7	17.5	18.1
	Up CI	18.8	19.9	24.3	20.8	21.8	20.3	20.0	20.8	19.0	20.5
	Low CI	14.7	13.4	18.1	17.2	17.3	16.9	16.4	16.8	16.1	15.8644

Figure 1-b. Trend for Percent of People Reporting Fair-to-Poor Health by Region, NC BRFSS 2000-2009



Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	177	327	431	822	1219	1308	1215	1201	1276	838
	Percent	18.6	19.2	21.9	19.9	22.8	20.7	20.5	21.7	19.6	20.8
	Up CI	22.0	23.7	24.6	23.3	25.3	23.2	22.7	23.3	21.5	25.4
	Low CI	15.6	15.5	19.5	17.0	20.6	18.4	18.5	20.1	17.8	16.8
PNC	N	278	501	620	733	1599	1913	1723	1392	1434	1242
	Percent	15.1	13.7	19.4	17.1	16.5	16.8	16.6	16.6	16.1	16.7
	Up CI	16.7	16.4	25.3	19.3	19.5	18.9	19.3	19.2	18.0	19.4
	Low CI	13.7	11.4	14.6	15.2	14.0	14.9	14.2	14.4	14.3	14.3
WNC	N	95	219	354	512	392	479	388	748	680	678
	Percent	18.4	20.5	25.5	24.0	23.3	21.0	19.4	21.5	19.2	18.5
	Up CI	20.8	22.8	30.4	26.8	26.1	22.5	22.0	23.2	21.8	22.3
	Low CI	16.2	18.5	21.1	21.4	20.8	19.6	17.0	19.9	16.9	15.1

Figure 1-c. Percent of People Reporting Fair-to-Poor Health by Region, NC BRFSS 2005-2009



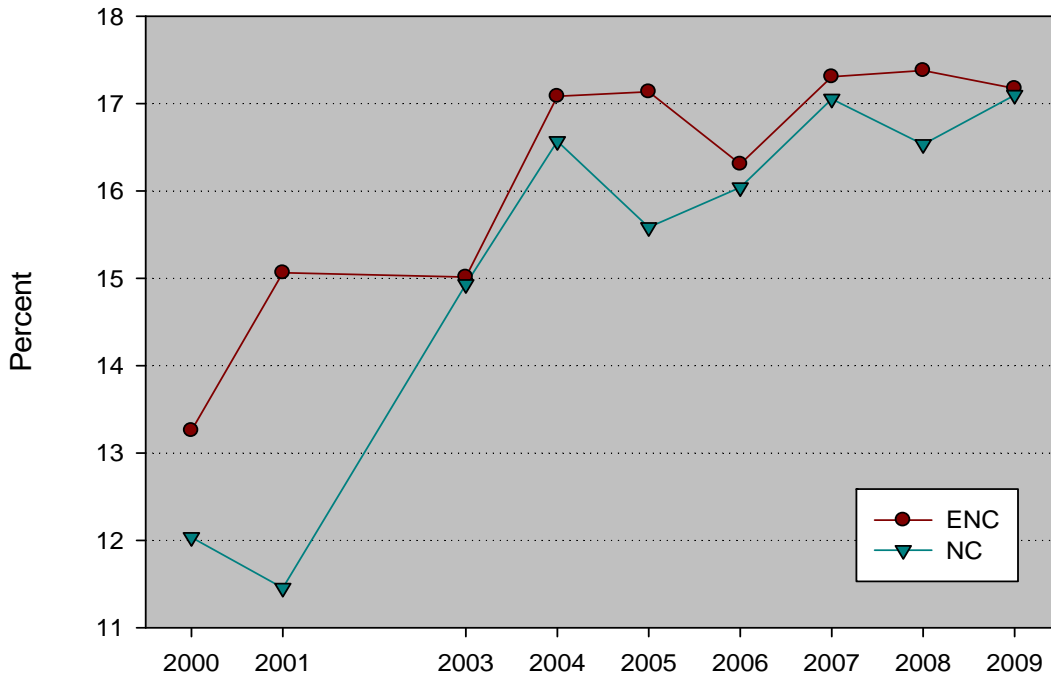
Medical Access

Medical access is crucial in maintaining good health. The percentage of people who reported they could not see a doctor due to medical cost has increased since 2000. Slightly different sets of questions were used regarding doctor visits in 2002 and produced a much smaller percent than those from previous years. For consistency, the results from 2002 data were not included in the graphs and tables here.

A major increase in the population who could not afford medical care in Eastern North Carolina seems to have occurred between 2000 and 2004. After 2004 the percent of people who could not afford medical care stays around 17% (Figure 2-a).

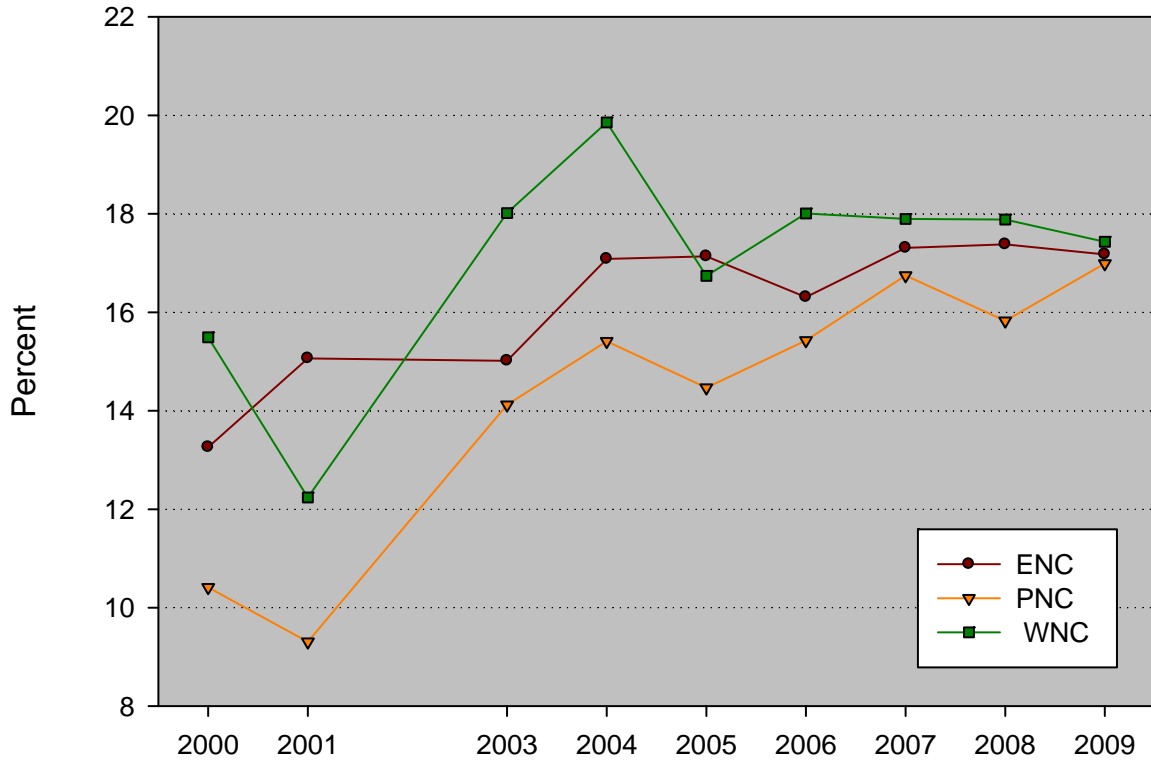
Over the ten-year period, regional differences become smaller, converging around 17% for the three regions (Figure 2-b). The comparisons among regions with the recent five-year aggregate data show a significant difference exists only between the Piedmont and Western North Carolina (Figure 2-c).

Figure 2-a. Trend for Percent of People Who Could Not See a Doctor Because of Cost in Eastern North Carolina Compared to North Carolina, NC BRFSS 2000-2009



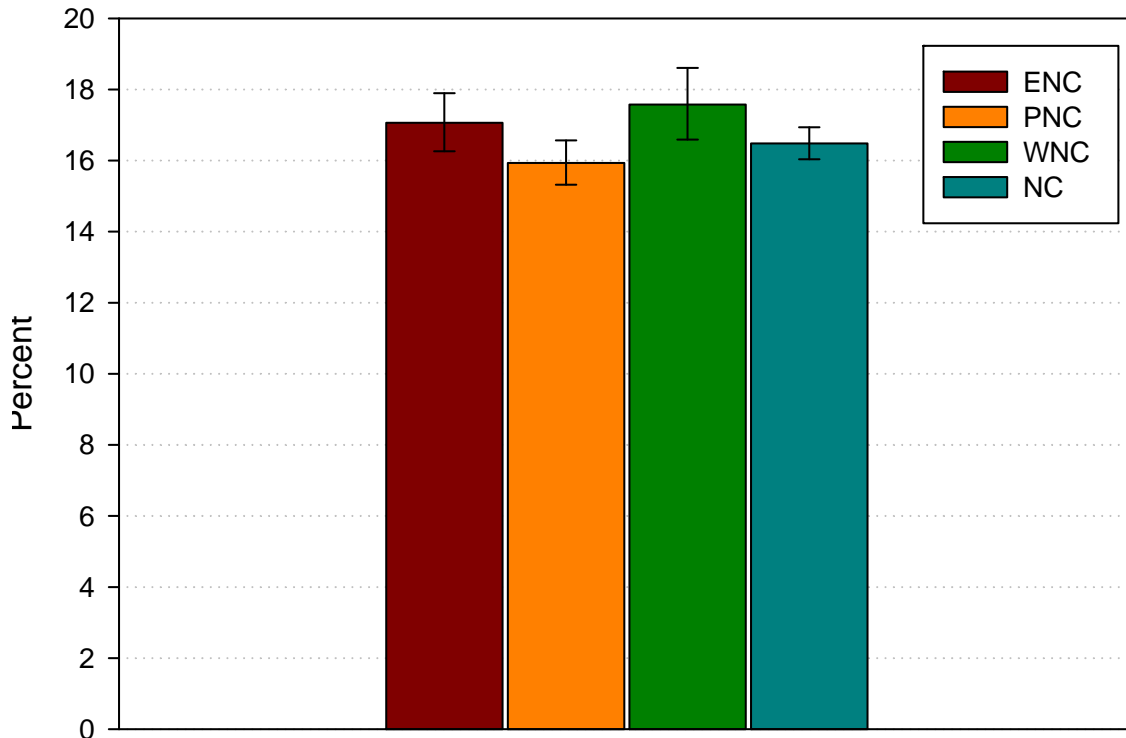
Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	130	221		564	876	878	757	732	791	570
	Percent	13.3	15.1		15.0	17.1	17.1	16.3	17.3	17.4	17.2
	Low CI	10.4	11.6		11.6	15.2	15.3	14.5	15.1	14.6	13.5
	Up CI	16.8	19.3		19.3	19.2	19.2	18.3	19.8	20.5	21.6
NC	N	380	664		1478	2492	2534	2178	2080	2225	1914
	Percent	12.0	11.5		14.9	16.6	15.6	16.0	17.1	16.5	17.1
	Low CI	11.2	8.8		12.1	15.2	14.4	14.7	15.5	14.8	15.4
	Up CI	13.0	14.7		18.2	18.0	16.9	17.5	18.7	18.5	18.9

Figure 2-b. Trend for Percent of People Who Could Not See a Doctor Because of Cost by Region, NC BRFSS 2000-2009



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	130	221	564	876	878	757	732	791	570
	Percent	13.3	15.1	15.0	17.1	17.1	16.3	17.3	17.4	17.2
	Low CI	10.4	11.6	11.6	15.2	15.3	14.5	15.1	14.6	13.5
	Up CI	16.8	19.3	19.3	19.2	19.2	18.3	19.8	20.5	21.6
PNC	N	180	321	583	1325	1338	1152	931	1001	918
	Percent	10.4	9.3	14.1	15.4	14.5	15.4	16.7	15.8	17.0
	Low CI	10.0	8.2	11.7	13.7	13.0	13.5	14.6	13.5	15.0
	Up CI	10.8	10.5	16.9	17.3	16.0	17.5	19.1	18.4	19.1
WNC	N	70	122	331	291	318	269	417	433	426
	Percent	15.5	12.2	18.0	19.9	16.7	18.0	17.9	17.9	17.4
	Low CI	14.1	11.7	11.6	16.2	14.8	13.8	14.0	15.2	15.0
	Up CI	17.0	12.8	26.9	24.1	18.8	23.1	22.5	20.9	20.2

Figure 2-c. Percent of People Who Could Not See a Doctor Because of Cost by Region, NC BRFSS 2005-2009



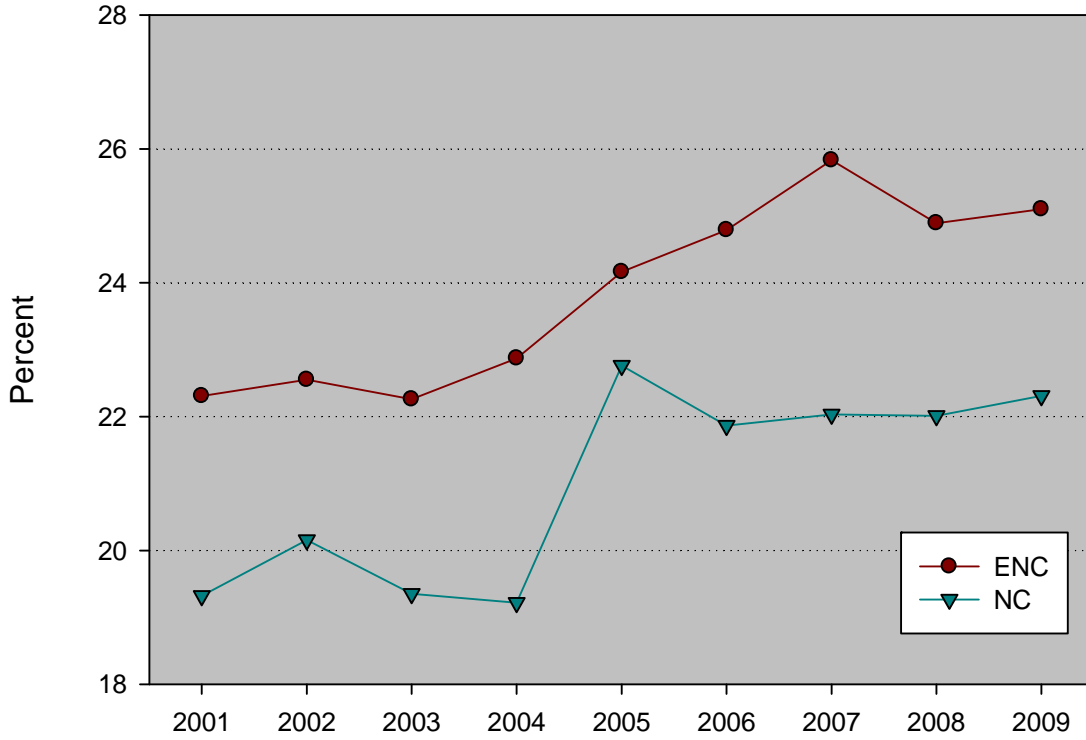
	ENC	PNC	WNC	NC
N	3728	5340	1863	10931
Mean	17.1	15.9	17.6	16.5
UCI	17.9	16.6	18.6	16.9
LCI	16.3	15.3	16.6	16.0

No Personal Doctor

A higher percentage of people in Eastern North Carolina reported not having a personal doctor than in the rest of the state. Over the past nine years, the percent of people without a personal doctor in Eastern North Carolina has been increasing (22.3% in 2001, and 25.1% in 2009).

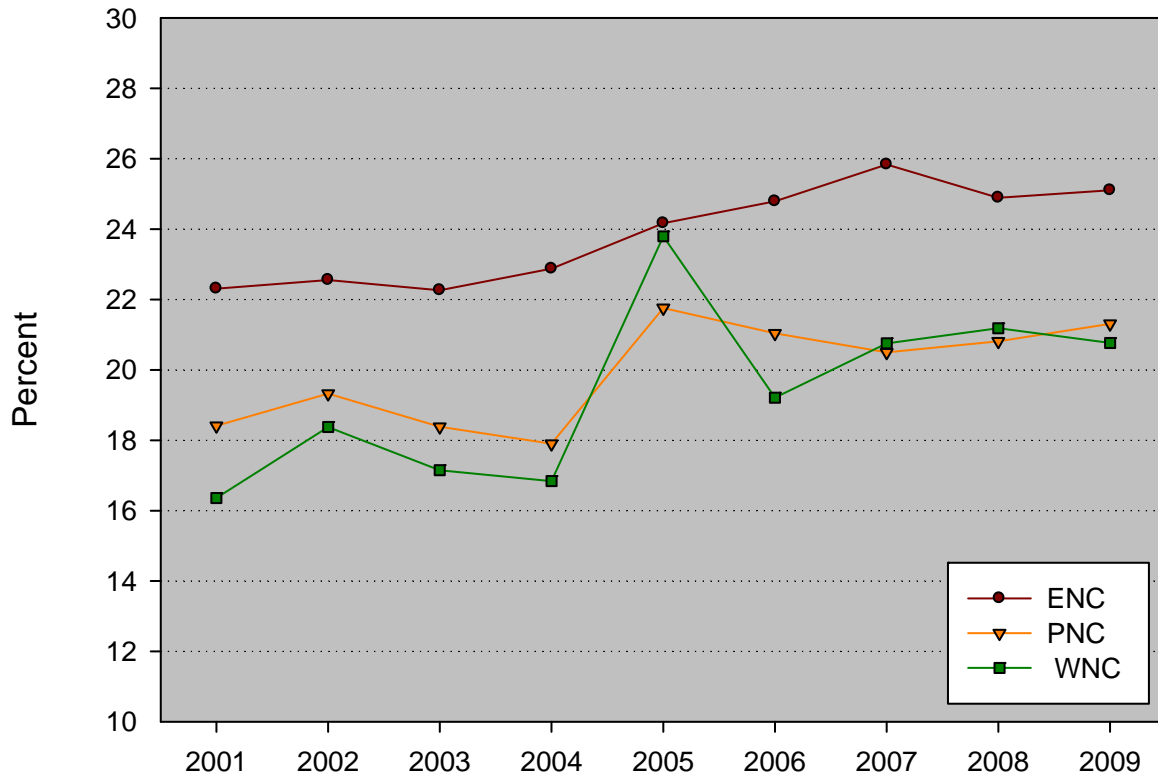
The percent of people without a personal doctor in the rest of the state has increased over the years. However, significantly more people living in Eastern North Carolina reported not having a personal doctor than in the other two regions of North Carolina during the past five years.

Figure 3-a. Trend for Percent of People without a Personal Doctor in Eastern North Carolina Compared to North Carolina, NC BRFSS 2001-2009



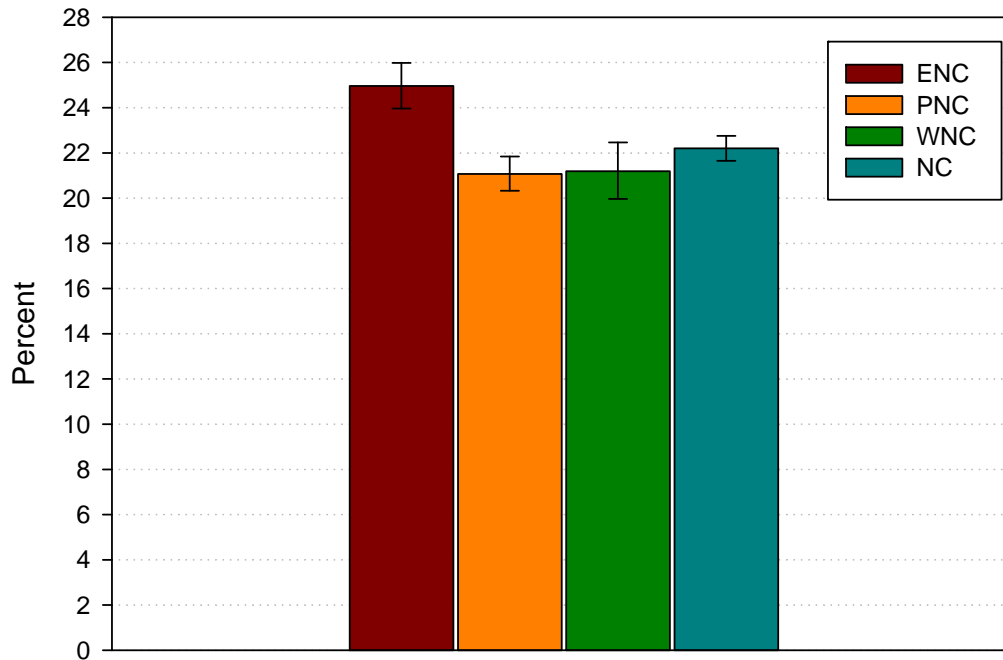
Year		2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	389	305	498	960	978	880	768	888	651
	Percent	22.3	22.6	22.3	22.9	24.2	24.8	25.8	24.9	25.1
	Up CI	25.5	33.5	26.2	25.6	26.3	27.5	30.1	28.3	28.8
	Low CI	19.4	14.4	18.8	20.4	22.1	22.2	22.0	21.8	21.8
NC	N	1034	1097	1418	2457	2811	2346	2060	2381	1959
	Percent	19.3	20.2	19.4	19.2	22.8	21.9	22.0	22.0	22.3
	Up CI	21.7	24.1	23.2	20.6	24.6	23.9	24.2	24.3	24.3
	Low CI	17.2	16.7	16.0	17.9	21.0	20.0	20.0	19.9	20.4

Figure 3-b. Trend for Percent of People without a Personal Doctor by Region, NC BRFSS 2001-2009



Year		2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	389	305	498	960	978	880	768	888	651
	Percent	22.3	22.6	22.3	22.9	24.2	24.8	25.8	24.9	25.1
	Low CI	19.4	14.4	18.8	20.4	22.1	22.2	22.0	21.8	21.8
	Up CI	25.5	33.5	26.2	25.6	26.3	27.5	30.1	28.3	28.8
PNC	N	492	553	630	1254	1506	1226	893	1047	900
	Percent	18.4	19.3	18.4	17.9	21.8	21.0	20.5	20.8	21.3
	Low CI	15.8	15.6	13.5	16.4	19.2	18.6	18.0	18.1	18.8
	Up CI	21.3	23.7	24.5	19.6	24.5	23.7	23.2	23.8	24.1
WNC	N	153	239	290	243	327	240	399	446	408
	Percent	16.4	18.4	17.1	16.8	23.8	19.2	20.8	21.2	20.8
	Low CI	14.5	14.2	14.4	15.2	20.1	15.9	16.7	18.2	17.5
	Up CI	18.4	23.4	20.3	18.7	27.9	23.0	25.4	24.5	24.5

Figure 3-c. Percent of People without a Personal Doctor by Region, NC BRFSS 2005-2009



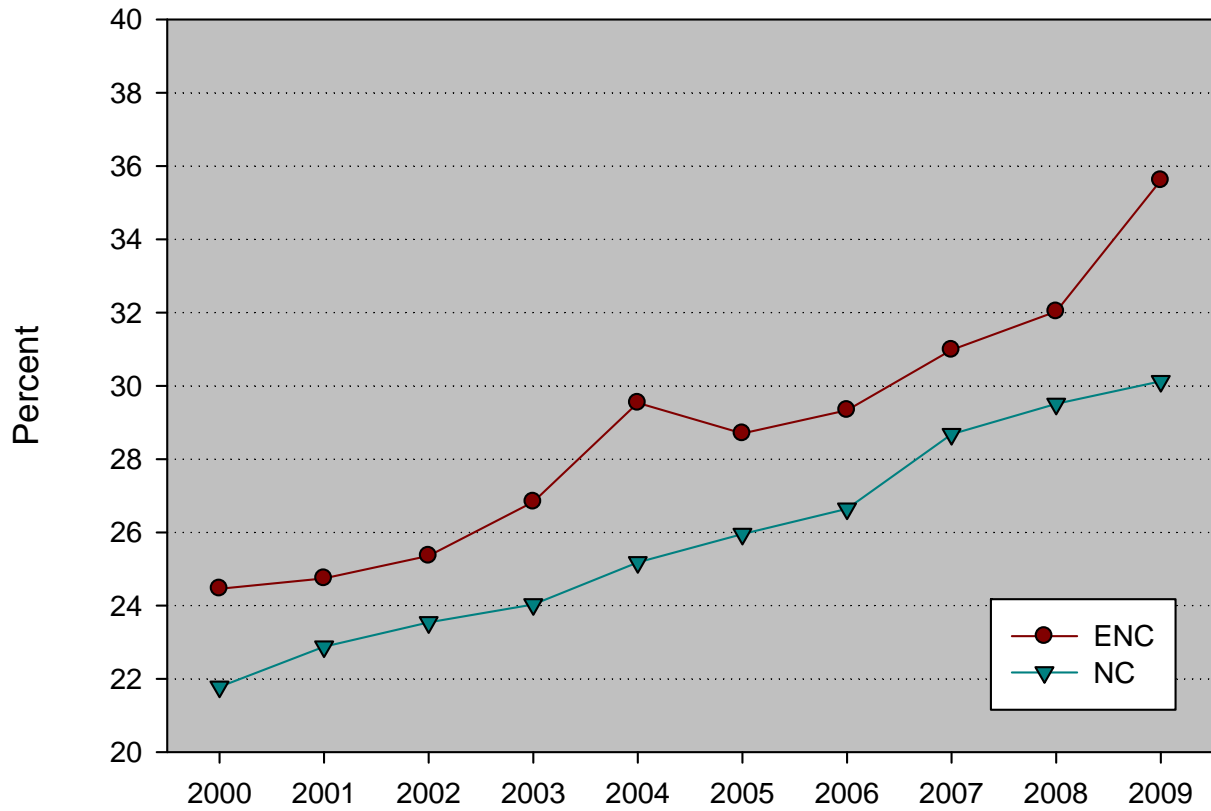
	ENC	PNC	WNC	NC
N	4165	5572	1820	11557
Mean	25.0	21.1	21.2	22.2
UCI	26.0	21.8	22.5	22.7
LCI	24.0	20.3	20.0	21.6

Obesity

The BRFSS collected height and weight measures from self-reports to construct the Body Mass Index (BMI). Height in meters is squared and then divided into weight recorded in kilograms. For adults 20 years and older in this survey, a BMI of 25.0 up to 30.0 is considered overweight. Those with a BMI of 30.0 and greater are considered obese.

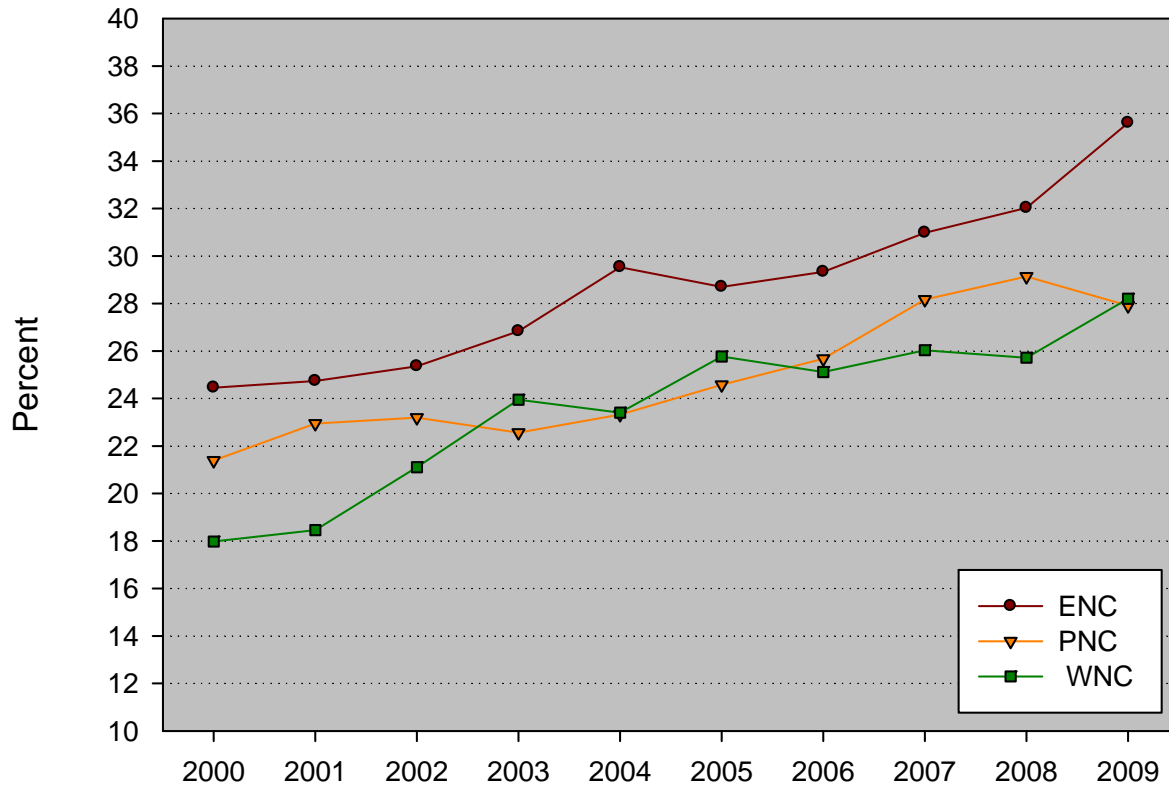
The percent of people who are obese has been increasing over the past ten years for the three regions of North Carolina. Eastern North Carolina exhibits a higher percentage of people who are obese than the other two regions and also a larger increase of obesity in the past 10 years (24.5% in 2000 to 35.6% in 2009).

Figure 4-a. Trend for Percent of People Who Are Obese in Eastern North Carolina Compared to North Carolina, NC BRFSS 2000-2009



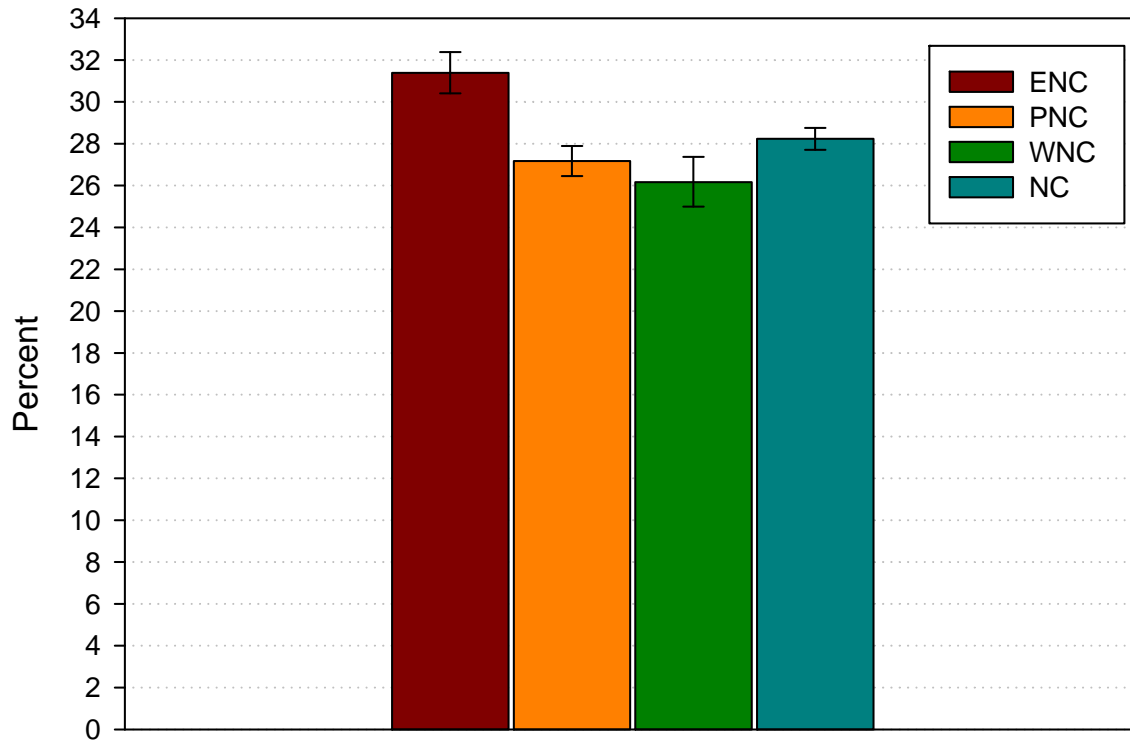
Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	224	414	407	968	1419	1654	1570	1495	1683	1219
	Percent	24.5	24.7	25.4	26.8	29.5	28.7	29.3	31.0	32.0	35.6
	Low CI	20.8	22.3	24.3	23.6	27.8	27.0	27.4	28.1	30.5	33.3
	Up CI	28.5	27.4	26.4	30.3	31.3	30.4	31.3	34.0	33.6	38.0
ENC	N	224	414	407	968	1419	1654	1570	1495	1683	1219
	Percent	24.5	24.7	25.4	26.8	29.5	28.7	29.3	31.0	32.0	35.6
	Low CI	20.8	22.3	24.3	23.6	27.8	27.0	27.4	28.1	30.5	33.3
	Up CI	28.5	27.4	26.4	30.3	31.3	30.4	31.3	34.0	33.6	38.0

Figure 4-b. Trend for Percent of People Who Are Obese by Region, NC BRFSS 2000-2009



Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	224	414	407	968	1419	1654	1570	1495	1683	1219
	Percent	24.5	24.7	25.4	26.8	29.5	28.7	29.3	31.0	32.0	35.6
	Low CI	20.8	22.3	24.3	23.6	27.8	27.0	27.4	28.1	30.5	33.3
	Up CI	28.5	27.4	26.4	30.3	31.3	30.4	31.3	34.0	33.6	38.0
PNC	N	341	690	665	887	1895	2356	2241	1864	1988	1741
	Percent	21.4	23.0	23.2	22.6	23.3	24.6	25.7	28.2	29.1	27.9
	Low CI	20.5	19.5	20.2	20.2	21.4	22.9	24.0	26.1	26.6	25.1
	Up CI	22.3	26.8	26.4	25.1	25.4	26.3	27.4	30.3	31.8	30.9
WNC	N	76	179	296	453	369	496	409	716	706	715
	Percent	18.0	18.5	21.1	24.0	23.4	25.8	25.1	26.0	25.7	28.2
	Low CI	16.8	17.3	19.1	20.5	19.7	23.4	22.2	22.3	23.5	23.9
	Up CI	19.2	19.7	23.3	27.8	27.6	28.2	28.2	30.2	28.0	32.9

Figure 4-c. Percent of People Who Are Obese by Region, NC BRFSS 2005-2009



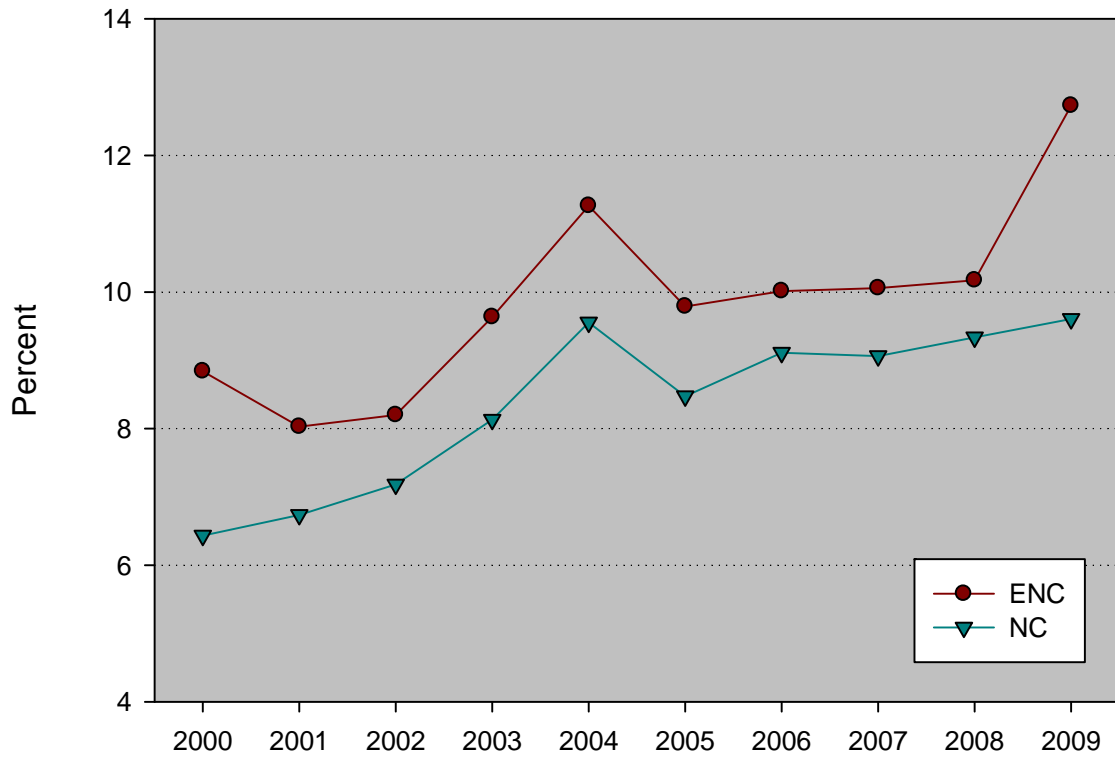
	ENC	PNC	WNC	NC
N	7621	10190	3042	20853
Mean	31.4	27.2	26.2	28.2
UCI	32.4	27.9	27.4	28.8
LCI	30.4	26.5	25.0	27.7

Diabetes

Having diabetes is a major health risk. In North Carolina, the percentage of people informed by a doctor or medical professional that they have diabetes has increased since 2000. In 2000, 8.8% of people in Eastern North Carolina had diabetes while in 2009, 12.7% had diabetes.

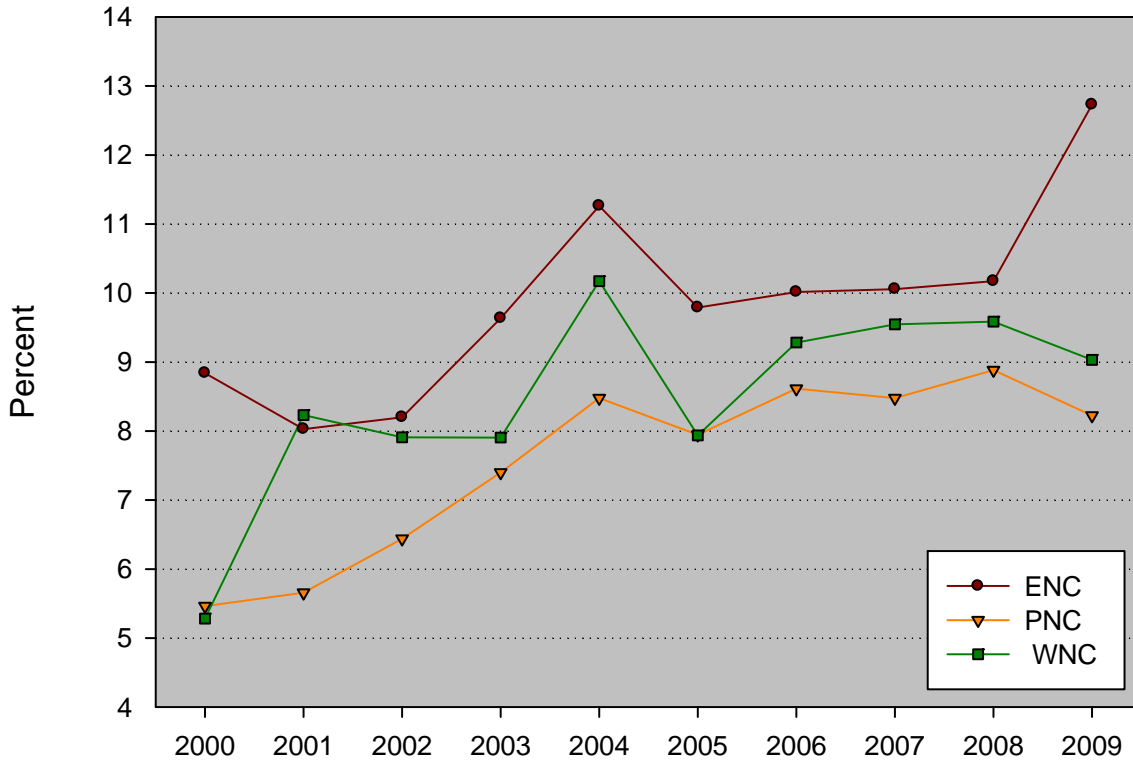
The results from the most recent 5 year aggregated data show that significantly more people in Eastern North Carolina have diabetes than in the Piedmont or Western North Carolina (11.1%, 8.8%, and 9.1%, respectively).

Figure 5-a. Trend for Percent of People with Diabetes in Eastern North Carolina Compared to North Carolina, NC BRFSS 2000-2009



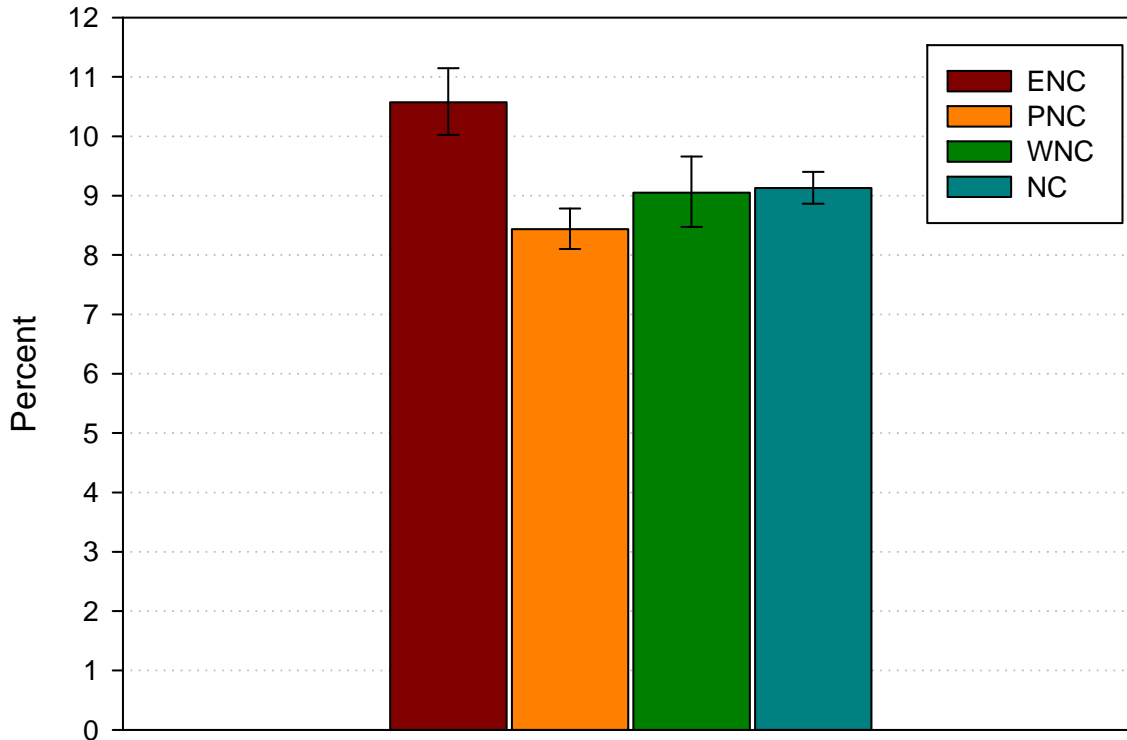
Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	86	140	170	425	601	666	694	657	738	571
	Percent	8.8	8.0	8.2	9.6	11.3	9.8	10.0	10.1	10.2	12.7
	Low CI	6.9	6.9	6.5	7.3	10.2	8.5	9.1	9.0	9.4	11.2
	Up CI	11.2	9.3	10.3	12.6	12.4	11.3	11.0	11.2	11.0	14.4
NC	N	230	451	528	959	1559	1849	1869	1825	1967	1719
	Percent	6.4	6.7	7.2	8.1	9.6	8.5	9.1	9.1	9.3	9.6
	Low CI	5.5	5.7	6.0	6.9	8.7	7.6	8.4	8.3	8.7	8.3
	Up CI	7.6	8.0	8.5	9.6	10.4	9.4	9.9	9.8	10.0	11.0

Figure 5-b. Trend for Percent of People with Diabetes by Region, NC BRFSS 2000-2009



Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ENC	N	86	140	170	425	601	666	694	657	738	571
	Percent	8.8	8.0	8.2	9.6	11.3	9.8	10.0	10.1	10.2	12.7
	Low CI	6.9	6.9	6.5	7.3	10.2	8.5	9.1	9.0	9.4	11.2
	Up CI	11.2	9.3	10.3	12.6	12.4	11.3	11.0	11.2	11.0	14.4
PNC	N	117	223	247	334	786	989	981	822	863	785
	Percent	5.5	5.7	6.4	7.4	8.5	7.9	8.6	8.5	8.9	8.2
	Low CI	4.8	5.1	4.7	6.2	7.5	6.9	7.7	7.7	8.1	7.1
	Up CI	6.2	6.3	8.7	8.7	9.5	9.2	9.7	9.4	9.8	9.5
WNC	N	27	88	111	200	172	194	194	346	366	363
	Percent	5.3	8.2	7.9	7.9	10.2	7.9	9.3	9.5	9.6	9.0
	Low CI	4.7	6.9	5.9	6.8	8.1	6.9	8.0	8.5	8.0	7.8
	Up CI	6.0	9.8	10.4	9.2	12.8	9.1	10.7	10.7	11.4	10.5

Figure 5-c. Percent of People with Diabetes by Region, NC BRFSS 2005-2009



	ENC	PNC	WNC	NC
N	3326	4440	1463	9229
Mean	10.6	8.4	9.1	9.1
UCI	11.1	8.8	9.7	9.4
LCI	10.0	8.1	8.5	8.9

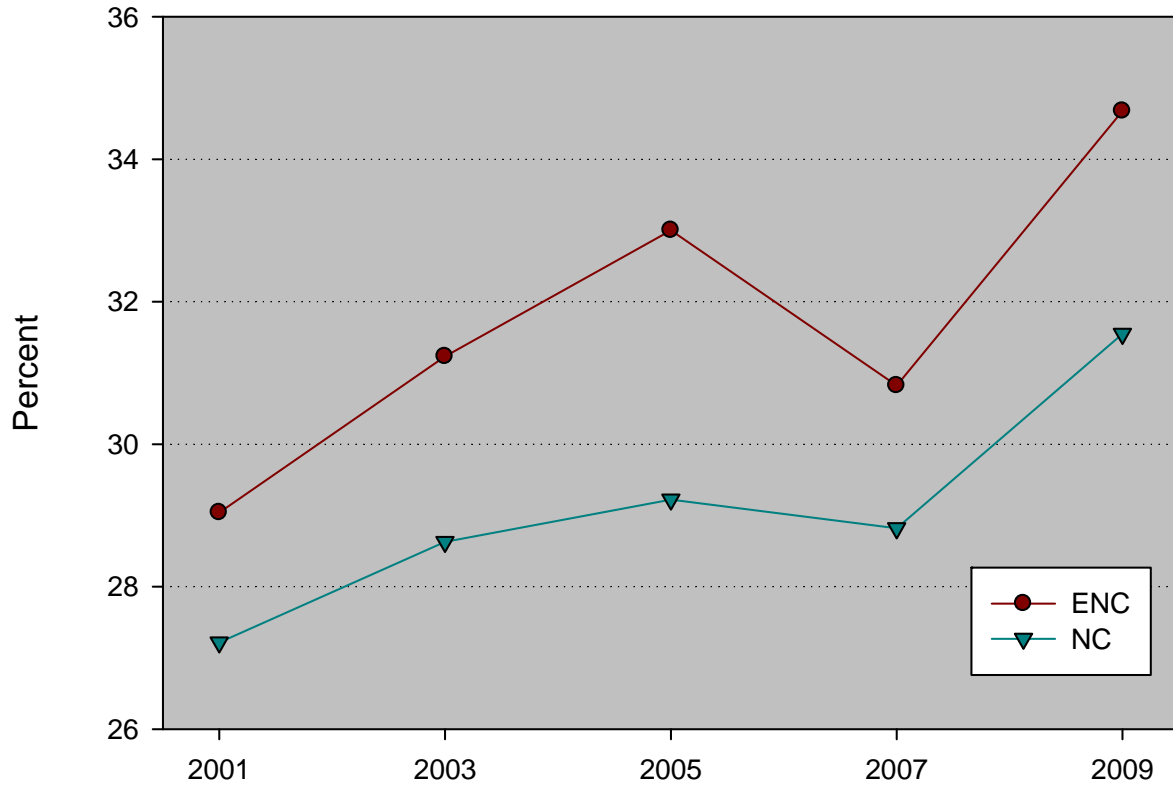
Hypertension

To obtain the prevalence of hypertension, BRFSS respondents were asked, "Have you EVER been told by a doctor, nurse, or other health professional that you have high blood pressure?" Female respondents who answered, "Yes, but only during pregnancy" were excluded from the analyses.

This question has been asked every other year since 2001. Except for the lower percent in 2007, the percent of people with high blood pressure has a general tendency of increase; in Eastern North Carolina, 27.2% of people had high blood pressure in 2001 while 31.5% of people in 2009 did.

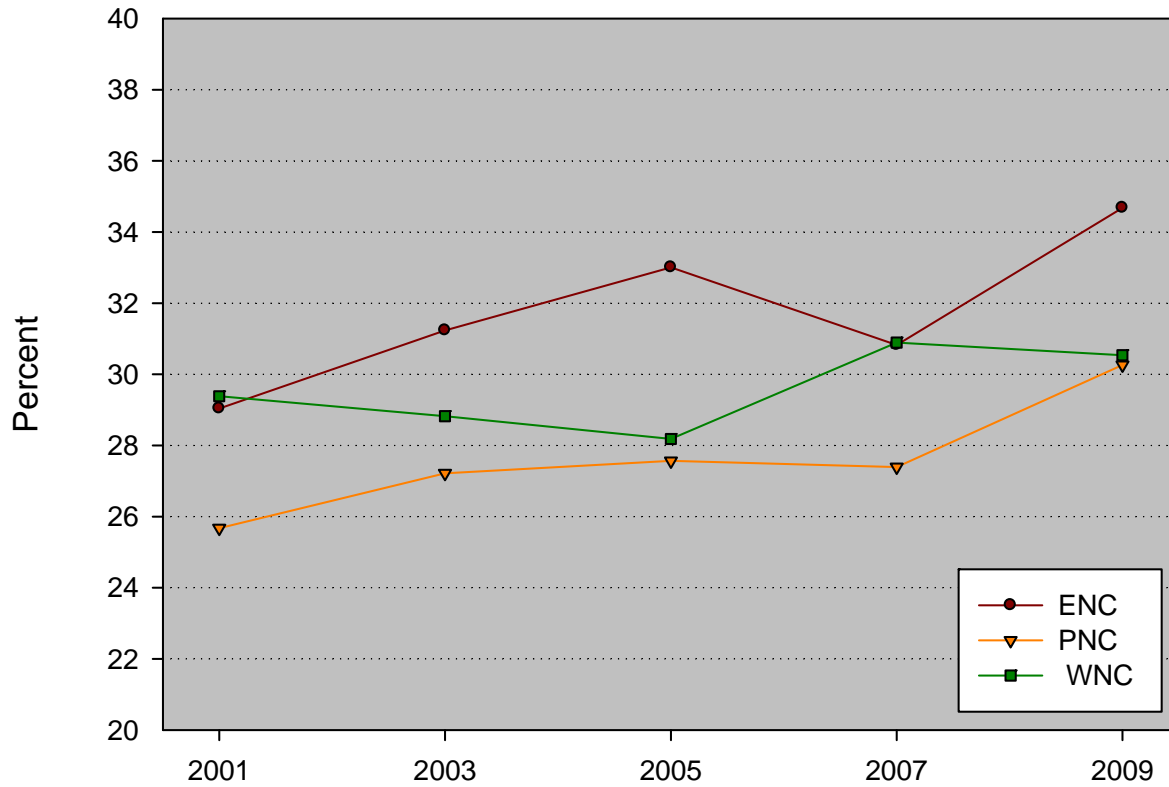
The comparison from the recent 5-year aggregated data shows that the percentage of people in Eastern North Carolina with high blood pressure is significantly higher than in the rest of North Carolina.

Figure 6-a. Trend for Percent of People with High Blood Pressure in Eastern North Carolina Compared to North Carolina, NC BRFSS 2001-2009



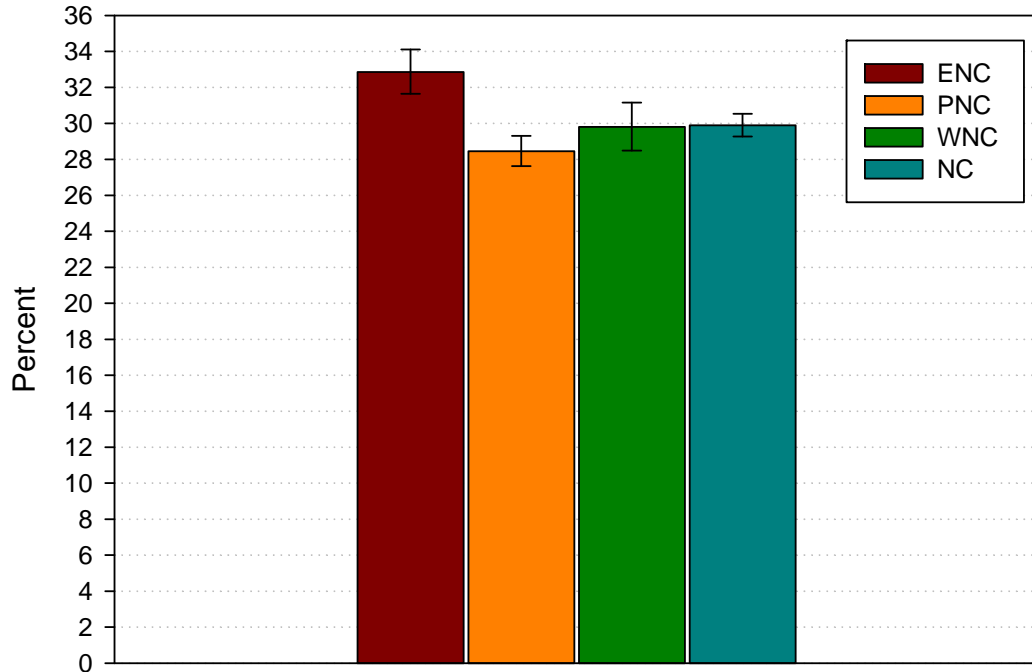
Year	2001	2003	2005	2007	2009	
ENC	N	542	1262	2161	1985	1576
	Percent	29.0	31.2	33.0	30.8	34.7
	Low CI	26.7	26.7	31.1	27.4	30.4
	Up CI	31.5	36.1	35.0	34.5	39.2
NC	N	1743	3188	6139	5692	5387
	Percent	27.2	28.6	29.2	28.8	31.5
	Low CI	24.4	26.0	27.5	27.0	29.4
	Up CI	30.2	31.4	31.0	30.8	33.8

Figure 6-b. Trend for Percent of People with High Blood Pressure by Region, NC BRFSS 2001-2009



Year	2001	2003	2005	2007	2009	
ENC	N	542	1262	2161	1985	1576
	Percent	29.0	31.2	33.0	30.8	34.7
	Low CI	26.7	26.7	31.1	27.4	30.4
	Up CI	31.5	36.1	35.0	34.5	39.2
PNC	N	888	1237	3297	2573	2663
	Percent	25.7	27.2	27.6	27.4	30.3
	Low CI	21.3	24.4	25.4	25.5	28.2
	Up CI	30.5	30.2	29.8	29.3	32.4
WNC	N	313	689	681	1134	1148
	Percent	29.4	28.8	28.2	30.9	30.5
	Low CI	27.7	27.1	24.9	28.4	25.7
	Up CI	31.1	30.6	31.7	33.5	35.8

Figure 6-c. Percent of People with High Blood Pressure by Region, NC BRFSS 2005-2009

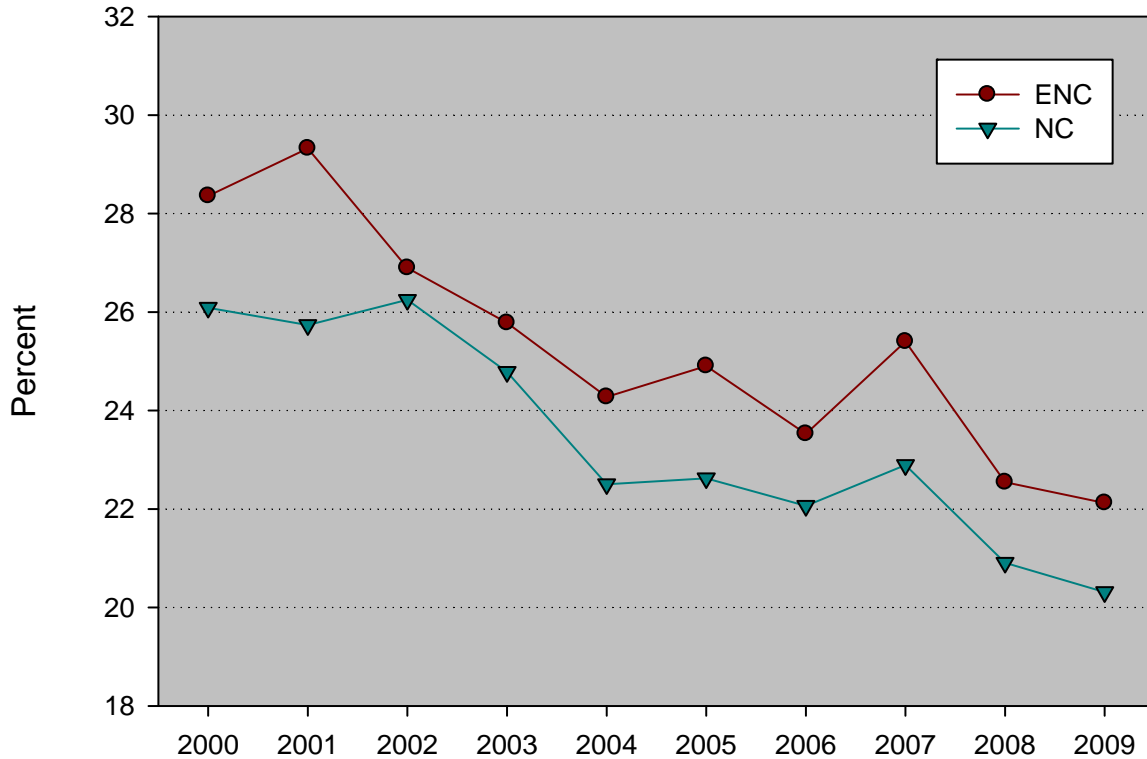


	ENC	PNC	WNC	NC
N	5722	8533	2963	17218
Mean	32.9	28.5	29.8	29.9
UCI	34.1	29.3	31.2	30.5
LCI	31.6	27.6	28.5	29.3

Current Smokers

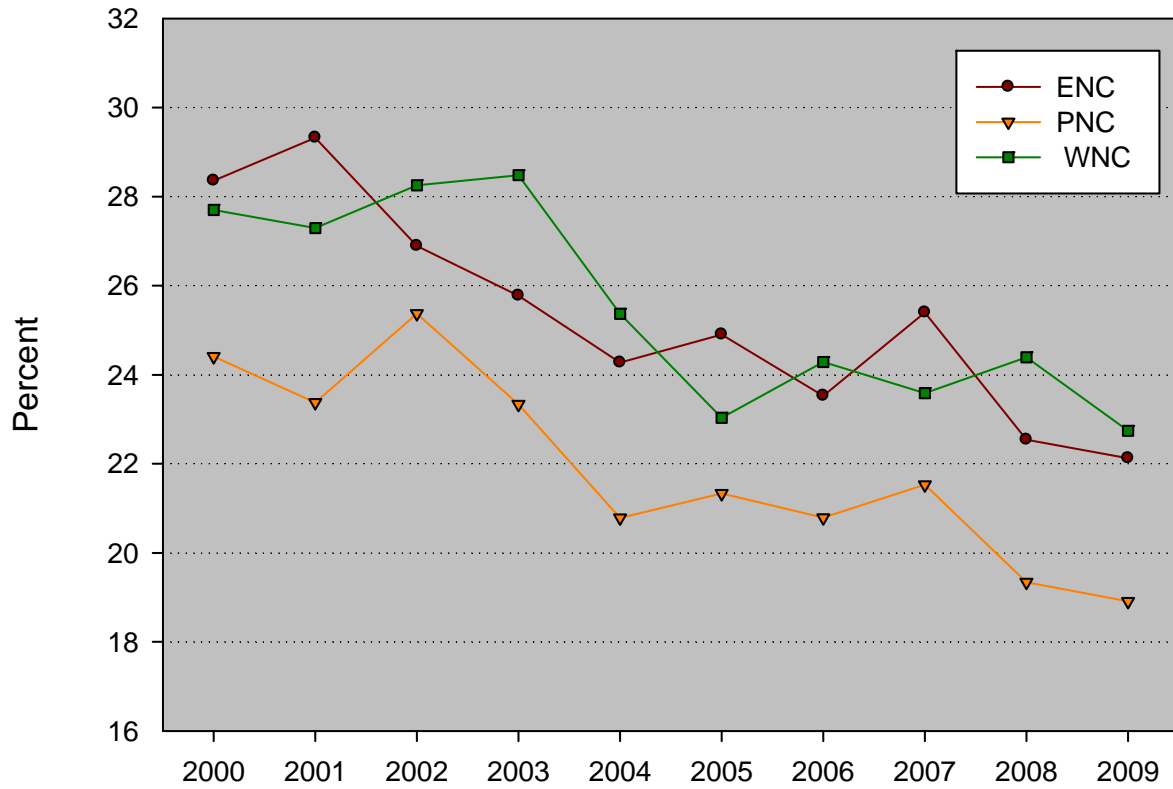
Smoking presents one of the major risks to health. The percent of people currently smoking has been generally falling since 2000. However, there are regional differences; the rates of current smokers are higher for Eastern and Western North Carolina than the Piedmont over the past ten years. The results from the aggregated data from the past 5 years show significant differences between the East and West and the Piedmont.

Figure 7-a. Trend for Percent of Current Smokers in Eastern North Carolina Compared to North Carolina, NC BRFSS 2000-2009



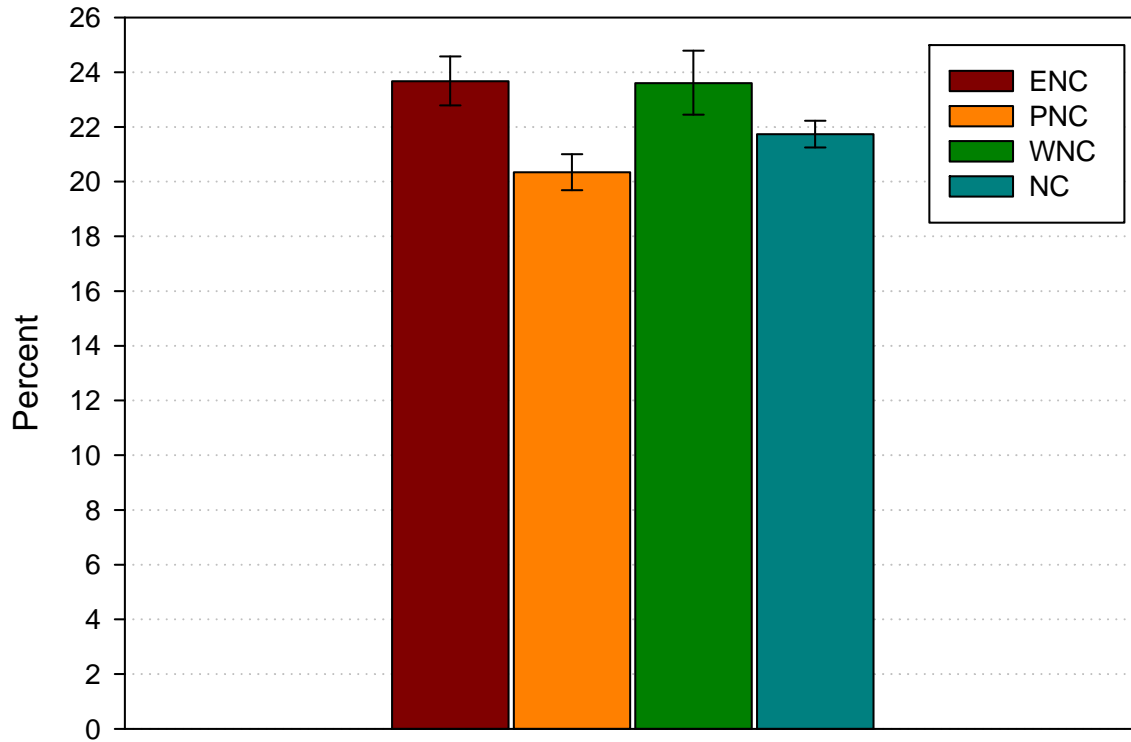
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
ENC	N	225	500	404	795	1163	1221	1107	1040	1000	728
	Percent	28.4	29.3	26.9	25.8	24.3	24.9	23.5	25.4	22.5	22.1
	Low CI	21.6	27.2	23.7	21.5	22.2	23.0	21.2	23.8	20.6	20.8
	Up CI	36.3	31.5	30.4	30.6	26.5	26.9	26.0	27.0	24.6	23.5
NC	N	726	1514	1535	2157	3333	3542	3133	2974	2878	2393
	Percent	26.1	25.7	26.2	24.8	22.5	22.6	22.1	22.9	20.9	20.3
	Low CI	23.2	23.3	23.7	21.4	20.9	20.9	20.1	21.1	18.7	18.6
	Up CI	29.2	28.4	29.0	28.5	24.2	24.4	24.1	24.8	23.3	22.1

Figure 7-b. Trend for Percent of Current Smokers by Region, NC BRFSS 2000-2009



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
ENC	N	224	414	407	968	1419	1654	1570	1495	1683	1219
	Percent	24.5	24.7	25.4	26.8	29.5	28.7	29.3	31.0	32.0	35.6
	Low CI	20.8	22.3	24.3	23.6	27.8	27.0	27.4	28.1	30.5	33.3
	Up CI	28.5	27.4	26.4	30.3	31.3	30.4	31.3	34.0	33.6	38.0
PNC	N	341	690	665	887	1895	2356	2241	1864	1988	1741
	Percent	21.4	23.0	23.2	22.6	23.3	24.6	25.7	28.2	29.1	27.9
	Low CI	20.5	19.5	20.2	20.2	21.4	22.9	24.0	26.1	26.6	25.1
	Up CI	22.3	26.8	26.4	25.1	25.4	26.3	27.4	30.3	31.8	30.9
WNC	N	76	179	296	453	369	496	409	716	706	715
	Percent	18.0	18.5	21.1	24.0	23.4	25.8	25.1	26.0	25.7	28.2
	Low CI	16.8	17.3	19.1	20.5	19.7	23.4	22.2	22.3	23.5	23.9
	Up CI	19.2	19.7	23.3	27.8	27.6	28.2	28.2	30.2	28.0	32.9

Figure 7-c. Percent of Current Smokers by Region, NC BRFSS 2005-2009



	ENC	PNC	WNC	NC
N	5096	7320	2504	14920
Mean	23.7	20.3	23.6	21.7
UCI	24.6	21.0	24.8	22.2
LCI	22.8	19.7	22.4	21.3

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