

# Asthma and Obesity in New Hampshire

## Introduction

Medical literature reports an association between asthma and obesity with higher rates of asthma among obese adults, although the reasons for the association between asthma and obesity remain unclear.<sup>1</sup>

At the same time, evidence suggests that public health interventions reducing obesity may result in improvements in asthma control, including reductions in medication use.<sup>2</sup>



## Methods

To examine the burden of asthma and obesity among New Hampshire residents, data from five surveys were analyzed, the New Hampshire Behavioral Risk Factor Surveillance System (BRFSS),<sup>3</sup> the BRFSS Adult Asthma Callback Survey (ACBS),<sup>4</sup> the National Survey of Children’s Health (NSCH),<sup>5</sup> the New Hampshire Youth Risk Behavior System (YRBS)<sup>6</sup>, and the New Hampshire Youth Tobacco Survey (YTS).<sup>7</sup>

For this issue brief, unless otherwise noted in the text, results are “significantly different” when the 95% confidence intervals for the percentages do not overlap (do not have values in common).

In some cases, when the 95% confidence intervals overlap but appear close, a statistical test (a Rao-Scott chi-square) was performed. This test produces a “p-value.” A p-value of 0.05 or less indicates there is good chance two estimates are truly different and not a result of random variation. That is, they are significantly different from a statistical standpoint.<sup>8</sup>



Asthma control was defined based on responses to three survey questions on the ACBS. The questions assessed symptom control, nighttime awakenings and short-acting beta antagonist (SABA) use, all in the previous 30 days. A survey respondent’s asthma was considered well controlled if they reported: they had symptoms on 8 or fewer days, nighttime awakenings on 2 or fewer nights, and SABA use on 2 or fewer days per week.<sup>8</sup>



Obesity in adults is commonly measured by calculating an individual’s Body Mass Index (BMI) using a mathematical formula that combines height and weight. Underweight is defined as a BMI less than 18.5, normal weight as a BMI between 18.5 to less than 25, overweight as a BMI of 25 to less than 30, obese as a BMI between 30 and 40, and morbidly obese as BMI over 40 (see Table 1).

Except where noted in this report, adult BMI will be categorized as “Normal or underweight,” “Overweight,” “Obese,” and “Morbidly obese” (Table 1). There were not enough survey respondents to further break down BMI into “Underweight” and “Normal weight” so these two categories were combined.

**Table 1. Adult Body Mass Index (BMI) categories**

Category	BMI
Underweight and normal weight	Less than 25.0
Overweight	25.0 – 29.9
Obese	30.0 – 40.0
Morbidly obese	More than 40.0

In children, overweight and obesity are commonly determined by calculating a child’s BMI and comparing it on a growth chart with those of other children of the same age and sex. The percentile on the chart where the BMI falls determines whether the child is considered underweight, normal weight, overweight, or obese. A child BMI in the 85<sup>th</sup> to less than 95<sup>th</sup> percentile is considered overweight while those over the 95<sup>th</sup> percentile are considered obese (Table 2).<sup>10</sup>

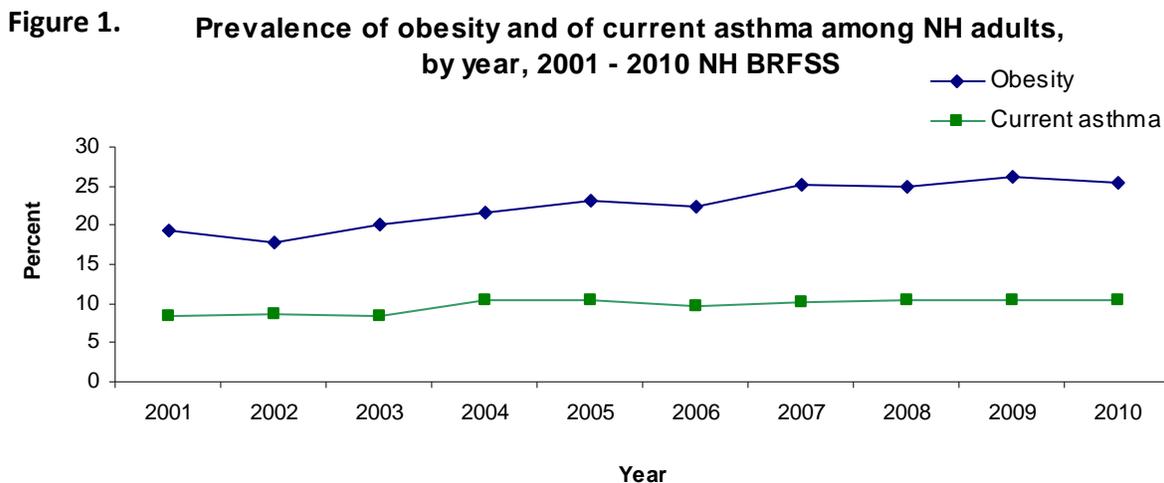
For this analysis, child BMI was categorized into “healthy or underweight,” “overweight” and “obese” due to small numbers of survey respondents.

**Table 2. Child weight categories by BMI percentile**

Weight Status Category	BMI Percentile Range
Healthy weight or underweight	Less than the 85 <sup>th</sup> percentile
Overweight or obese	85 <sup>th</sup> percentile or greater

**Results: Adults**

Between 2001 and 2010, a statistically significant increase was seen among New Hampshire adults in both the prevalence of current asthma ( $p=0.005$ ) and the prevalence of obesity ( $p<0.0001$ ). The prevalence of obesity increased more substantially from 19.4 percent to 25.6 percent (Figure 1, Table 3). The increase in asthma prevalence appears to be primarily due to an increase between 2003 and 2004.

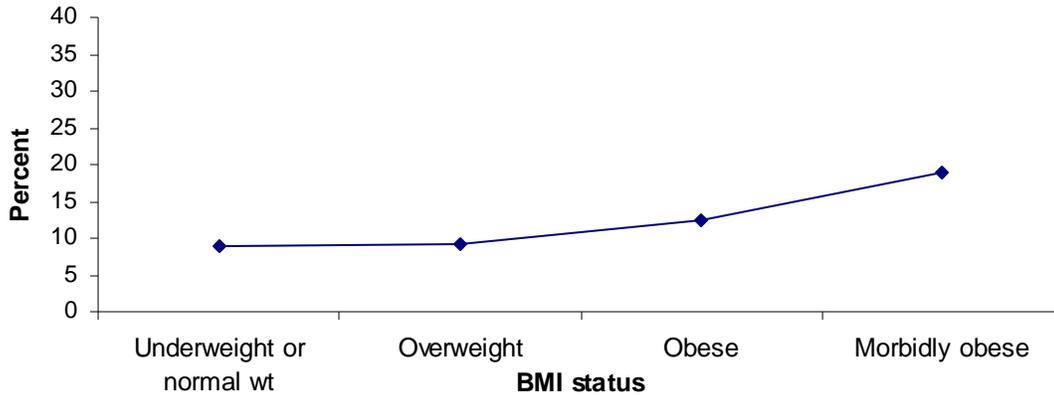


**Table 3. Prevalence of current asthma and obesity among NH adults, by year, 2001 - 2010 NH BRFSS**

Year	Current asthma		Obesity	
	Percent	95% CI	Percent	95% CI
2001	8.4	7.4-9.4	19.4	18.0-20.8
2002	8.7	7.8-9.6	17.9	16.7-19.1
2003	8.5	7.6-9.4	20.2	18.9-21.5
2004	10.3	9.3-11.3	21.6	20.2-22.9
2005	10.4	9.4-11.3	23.4	22.1-24.7
2006	9.7	8.8-10.6	22.6	21.2-24.0
2007	10.2	9.2-11.2	25.3	23.9-26.8
2008	10.5	9.5-11.5	25.1	23.7-26.5
2009	10.2	9.2-11.3	26.4	24.7-28.1
2010	10.1	9.0-11.2	25.6	23.9-27.2

In New Hampshire, the prevalence of adult current asthma was significantly higher among adults who were obese or morbidly obese compared with adults who were overweight or normal / underweight (Figure 2, Table 4).

**Figure 2. Current adult asthma by BMI status, 2009 and 2010 NH BRFSS**



**Table 4. Percentage of New Hampshire adults with current asthma by BMI status, 2009 and 2010 NH BRFSS**

BMI category	Percent	95% CI
Normal weight or underweight	9.0	7.7 - 10.3
Overweight	9.1	7.9 - 10.3
Obese	12.4	10.7 - 14.1
Morbidly obese	19.0	13.0 - 25.0

**Asthma control by BMI**

The proportion of New Hampshire adults with current asthma whose asthma was well controlled was significantly lower among those who were morbidly obese compared with adults with current asthma who were overweight or normal / underweight. Among adults who were normal / underweight, 59.9 percent had well controlled asthma compared with 35.6 percent of adults who were morbidly obese (Table 5).

**Table 5. Percentage of New Hampshire adults with current asthma having well controlled asthma, by BMI category, 2006 – 2010 ACBS**

BMI category	Percent	95% CI
Normal weight or underweight	59.9	52.8-67.1
Overweight	62.6	56.3-68.9
Obese	52.4	45.5-59.2
Morbidly obese	35.6	21.5-49.6

**Impact on work and usual activities**

The proportion of adults with current asthma reporting they were unable to work or carry out their usual activities due to their asthma was significantly higher among adults who were obese (0.02) or morbidly obese (0.0005) compared with those who were normal / underweight or overweight (Figure 3, Table 6).

**Figure 3. Percentage of NH adults with current asthma reporting three or more days lost of work or usual activities due to asthma in the past 12 months, by BMI category, 2006-2010 ACBS**

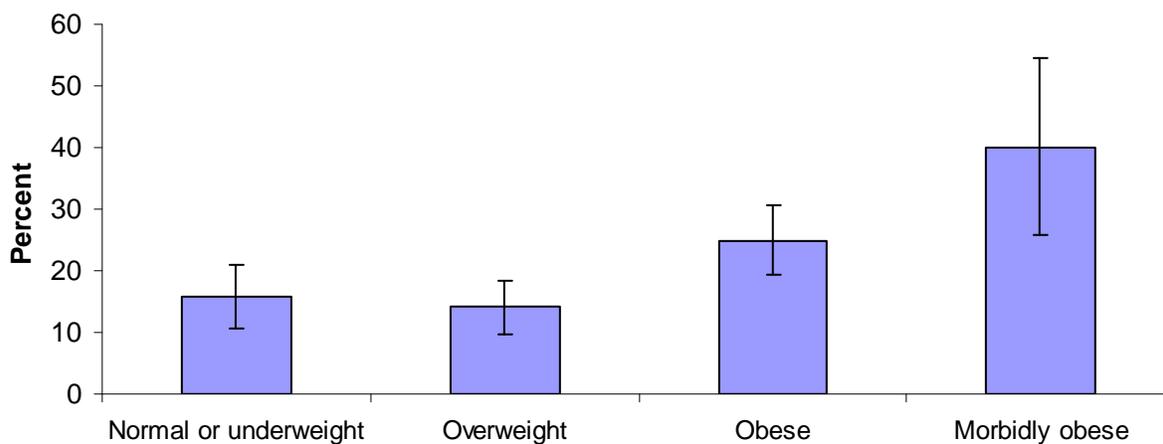


Table 6. Percentage of New Hampshire adults with current asthma reporting three or more lost days of work or usual activities due to asthma by BMI category, 2006 - 2010 ACBS

BMI category	Percent	95% CI
Normal or underweight	15.9	10.8-21.1
Overweight	14.1	9.7-18.5
Obese	25.0	19.4-30.7
Morbidly obese	40.1	25.8-54.4

**Co-morbidity**

Some chronic conditions related to obesity can aggravate asthma symptoms and complicate asthma control. These potentially complicating illnesses include cardiac diseases, diabetes, hypertension, mental health disorders, and obstructive sleep apnea.<sup>11</sup>

Among New Hampshire adults with current asthma, the prevalence of coronary heart disease (p=0.0003), diabetes, and hypertension was significantly higher among adults with higher BMI (Figure 4, Table 7).

The proportion of adults reporting frequent mental distress (14 or more days in the past 30 when mental health was not good) also increased significantly with increasing BMI (Figure 4, Table 7).

While no New Hampshire data are available on the prevalence of obstructive sleep apnea, the percentage of adults reporting not enough sleep (for a week or more in the past 30 days) increased significantly with increasing BMI (Figure 4, Table 7).

**Figure 4. Prevalence of selected chronic conditions by BMI category, among NH adults with current asthma, 2009, 2010 NH BRFSS**

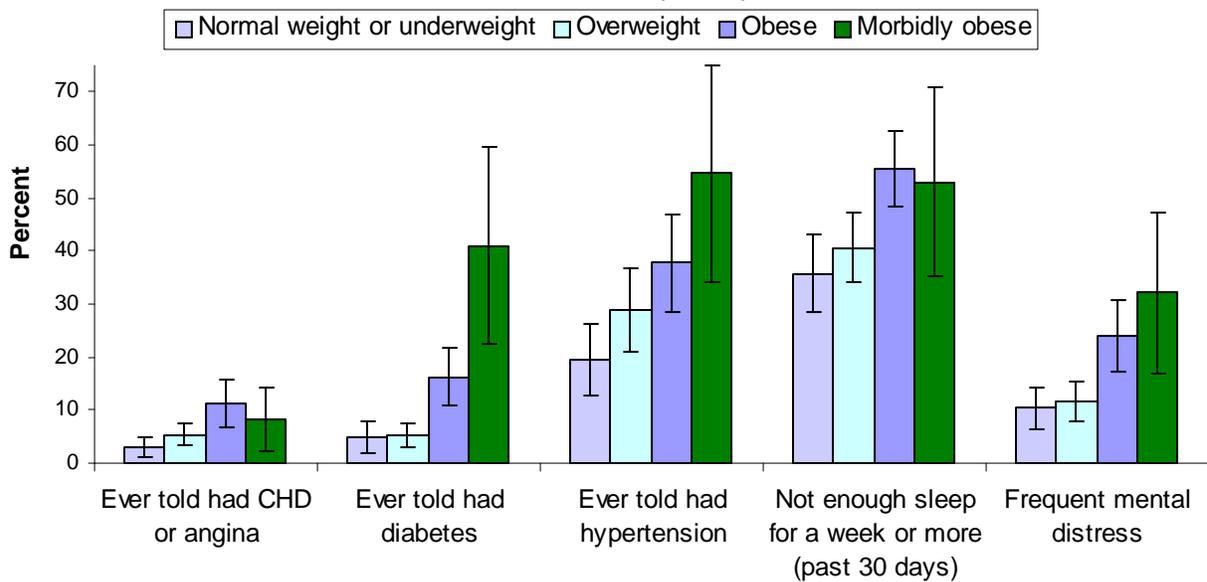


Table 7. Prevalence of selected chronic conditions by BMI category, among New Hampshire adults with current asthma, 2009, 2010 New Hampshire BRFSS

Condition	BMI Status	Percent	95% CI
Ever told had coronary heart disease (CHD) or angina	Underweight or normal wt	3.1	1.3 - 4.9
	Overweight	5.3	3.2 - 7.3
	Obese	11.3	6.9 - 15.8
	Morbidly obese	8.3	2.3 - 14.3
Ever told had diabetes	Underweight or normal wt	4.8	1.8 - 7.8
	Overweight	5.3	3.0 - 7.5
	Obese	16.3	10.9 - 21.6
	Morbidly obese	41	22.3 - 59.6
Ever told had hypertension 2009 (BRFSS only)	Underweight or normal wt	19.6	12.9 - 26.3
	Overweight	28.9	20.9 - 36.9
	Obese	37.8	28.6 - 47.0
	Morbidly obese	54.6	34.3 - 74.9
Not enough sleep for a week or more in the past 30 days	Underweight or normal wt	35.8	28.7 - 43.0
	Overweight	40.6	34.1 - 47.2
	Obese	55.6	48.5 - 62.6
	Morbidly obese	52.9	35.1 - 70.7
Frequent mental distress (14 or more days in past 30 when mental health was not good)	Underweight or normal wt	10.4	6.5 - 14.3
	Overweight	11.6	8.0 - 15.3
	Obese	24	17.2 - 30.8
	Morbidly obese	32.2	17.0 - 47.4

**Results: Children**

New Hampshire data regarding childhood obesity and asthma trends (see Appendix) are limited. Issues include few available years, small numbers of survey respondents and surveys in which questions on asthma and obesity were not asked together.

An analysis of available New Hampshire data found no evidence of a statistically significant changes in the prevalence of childhood obesity or current asthma over the limited time periods available or of a significant association between obesity and current asthma.

However, nationally, significant increases in the prevalence of obesity were seen among male children aged 2 to 19 years between 1999-2000 and 2009-2010. However among female children aged 2 to 19 years in the U.S., the prevalence of obesity did not change significantly between 1999-2000 and 2009-2010.<sup>12</sup>

In addition, nationally, statistically significant increases in child asthma and asthma exacerbation with increasing BMI have been reported.<sup>13</sup>



## Discussion

The analysis of the relationship between obesity and asthma in New Hampshire resulted in three major findings:

1. Among New Hampshire adults, the prevalence of current asthma was significantly higher among those with a higher body mass index.
2. The proportion of New Hampshire adults with well-controlled asthma was significantly lower and the proportion of New Hampshire adults with current asthma reporting missing days of work or usual activities due to their asthma was significantly higher among those with a higher body mass index.
3. No relationship between current asthma and increased BMI was found in available data on New Hampshire children although an association between asthma and obesity in children has been described in other populations.

These findings are of concern because the prevalence of both adult obesity and adult asthma has increased significantly in New Hampshire since 2001. Obesity increases asthma symptoms and makes asthma control more difficult,<sup>17</sup> and it is possible that some increase in asthma prevalence seen over the past decade may be attributable to increases in obesity.<sup>14</sup>

Medical literature reports an association between asthma prevalence, severity and control and higher body mass index.<sup>1, 11, 12</sup> Research has not yet provided an explanation for this association. Possible theories include common metabolic pathways for asthma and obesity or mechanical limits placed on the respiratory system.<sup>1</sup>

Although an increased prevalence of asthma among New Hampshire children was not found with higher body mass index, studies in other populations of children have reported significant associations between asthma and increasing BMI.<sup>1, 12</sup>

Research has demonstrated that public health interventions successfully reducing the prevalence of obesity result in improvements in asthma control, and possibly reductions in asthma prevalence.<sup>2</sup>

This report has at least three limitations: First, adult BMI based on telephone self-report tends to underestimate the true BMI,<sup>15</sup> and parental report of BMI for younger children tends to over estimate the true BMI.<sup>16</sup> (For this reason BMI in the NSCH is limited to children aged 10 years or older.) Second, survey respondent self-reports may also result in over- or under-estimation of the prevalence of chronic conditions, symptoms and other health related reports. Third, small numbers of survey respondents may have reduced the ability to detect significant differences that may actually exist in New Hampshire populations. In New Hampshire, data on child BMI and asthma together are found only in the New Hampshire Youth Risk Behavior Survey (YRBS) and New Hampshire respondents to the National Survey of Children's Health (NSCH). The NSCH provides obesity data only for children age 10 years and over<sup>15</sup> and the YRBS only surveys high school students.<sup>16</sup>

## References

1. Krystofova J, Jesenak M, Banovcin P. *Bronchial asthma and obesity in childhood*. Acta Medica 2011; 54(3):102-106.
2. Juel C, et. al. *Asthma and obesity: does weight loss improve asthma control? A systematic review*. J Asthma Allergy. 2012;5:21-26.
3. Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2001 – 2010.
4. Centers for Disease Control and Prevention, National Centers for Environmental Health, National Asthma Control Program, *Asthma Callback Survey (ACBS)*. Available at: <http://www.cdc.gov/asthma/ACBS.htm>. Accessed July 2012.
5. Centers for Disease Control and Prevention, National Center for Health Statistics. *State and Local Area Integrated Telephone Survey, National Survey of Children's Health*. Available at: <http://www.cdc.gov/nchs/slait/nsch.htm>. Accessed August 2012.
6. Centers for Disease Control and Prevention. *Methodology of the Youth Risk Behavior Surveillance System*. MMWR 2004;53(No. RR-12).
7. Centers for Disease Control and Prevention, Office on Smoking and Health. Youth Tobacco Survey (YTS) Survey Administrator Handbook. Available at: [http://www.cdc.gov/tobacco/data\\_statistics/surveys/yts/index.htm](http://www.cdc.gov/tobacco/data_statistics/surveys/yts/index.htm). Accessed February 2013.
8. Traore EA. *Appendix B: Technical Notes and Methods. Asthma Burden Report - New Hampshire 2010-2011*, pp 16 – 20. New Hampshire Department of Health and Human Services, Division of Public Health Services, Asthma Control Program. July, 2011.
9. Centers for Disease Control and Prevention, *Healthy weight, about BMI for adults*. Available at: [www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html#Interpreted](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html#Interpreted). Accessed June 20, 2012.
10. Centers for Disease Control and Prevention, *Healthy Weight - Its not a diet its a lifestyle, About BMI for children and teens*. Available at: [http://www.cdc.gov/healthyweight/assessing/bmi/childrens\\_bmi/about\\_childrens\\_bmi.html#How%20is%20BMI%20used%20with%20children%20and%20teens](http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html#How%20is%20BMI%20used%20with%20children%20and%20teens)
11. National Institutes of Health, National Heart, Lung, and Blood Institute. *Expert panel report 3: guidelines for the diagnosis and management of asthma*. Bethesda, MD: US Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute; 2007. Available at <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf>.
12. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity in the United States, 2009-2010. NCHS data brief, no 82. Hyattsville, MD: National Center for Health Statistics. 2012.
13. Visness CM, et al. *Association of childhood obesity with atopic and non-atopic asthma: Results from the National Health and Nutrition Examination Survey 1999-2006*. J Asthma. 2010 September: 47(7): 822-829.
14. Jiang Y, Chen Y, Manuel D, Morrison H, Mao Y. *Quantifying the impact of obesity category on major chronic diseases in Canada*. Scientific World journal (2007) 7, 1211–1221.

15. Ezzati M et al. *Trends in national and state-level obesity in the USA after correction for self-report bias: analysis of health surveys*. J R Soc Med 2006;99:250–257.
16. *Nonresponse in the National Survey of Children’s Health, 2007*. National Center for Health Statistics. Vital Health Stat 2(156)
17. Trunk-Black C, Ulrik CS. *Obesity and Asthma: Impact on severity, asthma control and response to therapy*. Respiratory Care. Paper in Press. Published prior to print on December 11, 2012 as DOI: 10.4187/respcare.02202. Available at: <http://rc.rcjournal.com/search?fulltext=Trunk-Black&submit=yes&x=8&y=15>. Accessed February 2013.

**Appendix: Available New Hampshire data on asthma and obesity in children**

**Table 8. Prevalence of current asthma by year and gender, New Hampshire Youth Tobacco Survey**

Year	Male		Female	
	Percent	95% CI	Percent	95% CI
2004	13.4	10.3-16.5	16.0	12.6-19.4
2007	18.7	15.3-22.0	18.4	15.1-21.7
2009	14.4	11.5-17.2	18.8	16.2-21.5
2011	15.3	11.9-18.7	18.1	15.1-21.1

**Table 9. Prevalence of current asthma among New Hampshire high school students, by BMI category, 2011 Youth Risk Behavior Survey**

	Percent	95% CI
Underweight or normal wt (less than 85th %)	15.2	12.9-17.4
Overweight (85th to less than 95th %)	16.8	10.7-22.9
Obese (over 95th %)	18.9	13.1-24.7

**Table 10. Prevalence of current asthma among New Hampshire children less than 18 years of age, by year and gender, National Survey of Children’s Health**

	Male		Female	
	Percent	95% CI	Percent	95% CI
2003	8.6	6.7-10.6	7.3	5.5-9.1
2007	9.5	6.9-12.1	8.0	5.8-10.3

**Table 11. Prevalence of obesity among New Hampshire children, aged 10 to 17 years by year and gender, National Survey of Children’s Health**

	Male		Female	
	Percent	95% CI	Percent	95% CI
2003	18.0	13.6-22.3	7.5	4.9-10.1
2007	16.3	12.1-20.5	8.8	5.0-12.5

**Table 12. Prevalence of obesity among New Hampshire public high school students by year and gender, Youth Risk Behavior Survey**

Year	Male		Female	
	Percent	95% CI	Percent	95% CI
2003	12.6	9.7–16.2	6.5	4.6–9.0
2005	14.9	11.6–18.9	7.7	5.5–10.7
2007	15.8	12.8–19.3	7.0	5.4–8.9
2009	16.1	12.0–21.3	7.2	5.5–9.5
2011	14.5	12.0–17.5	9.4	7.0–12.0

**Table 13. Prevalence of current asthma by BMI status, children 10 to 17 years, NSCH, 2003 and 2007**

	Percent	95% CI
Underweight or normal wt (less than 85th %)	10.4	8.5-12.4
Overweight (85th to less than 95th %)	9.7	6.0-13.4
Obese (over 95th %)	16.4	10.2-22.5

### DISCLAIMER

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### WHERE TO GO FOR MORE INFORMATION

For more information about living with asthma, visit the following web pages or contact the New Hampshire Asthma Control Program at (603) 271-0855.

New Hampshire Asthma Control Program  
<http://www.dhhs.nh.gov/dphs/cdpc/asthma/>

New Hampshire Asthma Collaborative  
<http://www.asthmanownh.org/>

Centers for Disease Control and Prevention (CDC), National Asthma Program  
<http://www.cdc.gov/asthma/>

For more information about prevention and control of obesity, contact the New Hampshire Obesity Prevention Program at

Obesity Prevention Program (603) 271-4551  
Obesity Prevention Toll Free (800) 852-3345, ext. 4551

<http://www.dhhs.nh.gov/dphs/nhp/obesity.htm>

Or

HEALNH (Healthy Eating, Active Living)

<http://www.healnh.org/>