Obesity and Asthma: Consequences on Asthma Medication Use, Episodes, and Emergency Room Visits

Winston Liao¹ and Robert Woldman²

¹Asthma Program and ²State Center for Health Statistics
Division of Public Health
North Carolina Department of Health & Human Services

The “What’s” for This Presentation

► What has been said about the issue (i.e., obesity and asthma)

► What does the North Carolina data show (including role of demographic factors)

► What do the results mean
What the U.S. Surgeon General Said:

2001: “...these trends are associated with dramatic increases in conditions such as asthma, and in Type 2 diabetes among children.” [David Satcher, MD]

2003: “…excess weight significantly increases our kids’ risk factors for a range of health problems, including diabetes, heart disease, asthma, and emotional and mental health problems.” [Richard Carmona, MD]

2008: “Obesity is associated with a higher prevalence of asthma.” [Office of the Surgeon General]
What the Media and Others Said:

“…Compared to adults with healthy weight (BMI values from 18.5 to 24.9), those with a body mass index of 40 or higher had an increased risk of being diagnosed with … asthma (2.72 times greater), …” [CDC, December 31, 2002]

“Evidence is now mounting that obesity is also a risk factor for asthma. Reports have shown that nearly 75 percent of emergency room visits for asthma have been among obese individuals and studies have shown that obesity pre-dates asthma.” [Medical News Today, May 10, 2005]
What the Media and Others Said (Cont.):

“Obesity makes asthma worse: study”
[Reuters web article headline, May 22, 2007]

“Are epidemics in asthma and obesity linked?”
[Daily Mail article headline, September 17, 2007]

“Weight gain may make asthma control more difficult”
[Reuters web article headline, November 12, 2007]

“Asthma and Obesity: A Losing Combination”
[HealthCentral.com article headline, March 5, 2008]
No lack for studies:

192 Periodical Search Results You searched for "asthma" AND "obesity" within Journal of Allergy and Clinical Immunology [New Search | Edit Search | Save Search | Save Search as an E-mail Alert]

Viewing 1-20 of 192 results [Next 20> Results Page: [1] 2 3 4 5 6 7 >
Display:

- Continuing Medical Education examination: The epidemiology of obesity and asthma
  The Journal of Allergy and Clinical Immunology
  May 2005 (Vol. 115, Issue 5, Page 910)
  Full-Text PDF (31 KB)

- Reduced FEV1/FVC in obese versus normal weight children with asthma
  The Journal of Allergy and Clinical Immunology
  February 2005 (Vol. 115, Issue 2, Page S228)
  Full Text | Full-Text PDF (33 KB)
What the Epidemiologists Said:

► “Overweight and obesity are associated with a dose-dependent increase in the odds of incident asthma in men and women, suggesting asthma incidence could be reduced by interventions targeting overweight and obesity.” [Beuther and Sutherland, 2007]

► “Although a considerable number of studies using different study designs indicate that excess weight might increase the risk of asthma development, the topic remains controversial because of potential methodological limitations...” [Ford, 2005]
Methodologic Inadequacies

- **Definitions of asthma**: asthma-like symptoms vs. true asthma
- **Use of anthropometric measures**: self-reported weight and height
- **Directionality of causation**: cross-sectional and case-control studies
- **Diagnostic or detection bias**: asthma diagnosed more frequently among the obese?
- **Incomplete accounting of confounding**: diet, physical activity, GERD, sleep-disordered breathing
What the Clinicians Said:

► “…obesity appears to predispose toward airway hyperresponsiveness… obesity-related changes in lung development, chronic systemic inflammation (including increased serum levels of inflammatory cytokines and chemokines)…” [Shore and Fredberg, 2005]

► “…therapeutic responses to montelukast appeared to increase with increasing BMI… increasing BMI did not confer a similar increase in responsiveness to beclomethasone…” [Golden et al., 2006]
Interpretation(s)

- Changes in the blood levels of hormones derived from fat tissue in the obese may affect the airways.
- Other adipocyte-derived factors might alter airway smooth muscle function in such a way as to promote airway narrowing.
- Asthma in the overweight/obese may be a more leukotriene-driven form of asthma than in those of normal BMI.
- Increased asthmatic inflammation that exists in the overweight/obese may be relatively corticosteroid-resistant.
What the NC Asthma Program is Trying to Find Out

► Is there a relationship between asthma prevalence and obesity?

► If so, what does this relationship look like with respect to four asthma-related behaviors?
What We Did

► Our source of data:
  • 2006 North Carolina Behavioral Risk Factor Surveillance System data for adults 18+ years of age with asthma who are obese (n=479) and not obese (n=637)
    ■ Annual statewide random telephone survey
    ■ Developed by CDC; currently conducted in all 50 states, DC, 3 territories
    ■ Wide range of issues on health behavior and preventive health practices related to leading causes of death and disability
What We Did (Cont.)

Our source of data:

- BMI Calculation:
  - “About how much do you weigh without shoes?”
    (pounds/kilograms – fractions rounded up)
  - “About how tall are you without shoes?”
    (feet & inches/meters & centimeters – fractions rounded down)
  - Formula: \([\text{Weight (lb)} / \text{height (in)}^2] \times 703\)
### What We Did (Cont.)

![BMI Chart Image]

#### Body Mass Index Table

<table>
<thead>
<tr>
<th>Height (inches)</th>
<th>Normal</th>
<th>Overweight</th>
<th>Obese</th>
<th>Extreme Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>50</td>
<td>81</td>
<td>89</td>
<td>97</td>
<td>103</td>
</tr>
<tr>
<td>60</td>
<td>91</td>
<td>100</td>
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<td>115</td>
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<tr>
<td>70</td>
<td>100</td>
<td>115</td>
<td>129</td>
<td>134</td>
</tr>
<tr>
<td>80</td>
<td>115</td>
<td>129</td>
<td>137</td>
<td>143</td>
</tr>
</tbody>
</table>

### Source:

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**North Carolina**

**Asthma**
What We Did (Cont.)

► Our source of data:

• **Lifetime asthma:**
  “Have you ever been told by a doctor, nurse, or other health professional that you had asthma?”
  ■ Yes: 1768 (10.9%)

• **Current asthma:**
  “Do you still have asthma?”
  ■ Yes: 1178 (6.8%)
What We Did (Cont.)

The variables we were interested in:

• **Asthma episodes:**
  “During the past 12 months, have you had an episode of asthma or an asthma attack?”

• **Inhaler use:**
  “During the past 30 days, how often did you use a prescription asthma inhaler DURING AN ASTHMA ATTACK to stop it?”
The variables we were interested in:

- **Asthma medication use:**
  “During the past 30 days, how many days did you take a prescription asthma medication to PREVENT an asthma attack from occurring?”

- **Emergency department (ED) visits:**
  “During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?”
How We Analyzed the Data

Logistic regression models were used:

- To determine predictors of ED/urgent care usage, use of prescription asthma medications, and use of asthma inhalers
- Control for race, gender, and income status
What We Found

<table>
<thead>
<tr>
<th>BMI*</th>
<th>Lifetime Asthma**</th>
<th>Current Asthma***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n=1683</td>
<td>No n=13,171</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended Range</td>
<td>9.3%</td>
<td>90.7%</td>
</tr>
<tr>
<td>Overweight</td>
<td>10.0</td>
<td>90.0</td>
</tr>
<tr>
<td>Obese</td>
<td>14.8</td>
<td>85.2</td>
</tr>
</tbody>
</table>

*Recommended Range= BMI 18.5–24.9; Overweight= BMI 25.0-29.9; Obese= BMI >30.0
** $X^2=38.89$, $p<.0001$
*** $X^2=58.01$, $p<.0001$
What Else Did We Find?

<table>
<thead>
<tr>
<th></th>
<th>No. of Observations</th>
<th>OR Estimate</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma Episodes</td>
<td>916</td>
<td>1.84</td>
<td>1.27</td>
<td>2.65</td>
</tr>
<tr>
<td>Asthma Inhaler Use</td>
<td>901</td>
<td>1.50</td>
<td>1.04</td>
<td>2.18</td>
</tr>
<tr>
<td>Rx Asthma Medication Use</td>
<td>913</td>
<td>1.09</td>
<td>0.75</td>
<td>1.60</td>
</tr>
<tr>
<td>Emergency Dept. Visits</td>
<td>925</td>
<td>1.69</td>
<td>1.09</td>
<td>2.64</td>
</tr>
</tbody>
</table>
What Does That Mean?

► Obese asthmatics, when compared with non-obese asthmatics
  • Have to use prescription asthma inhalers more often
  • Have more asthma episodes
  • Have more emergency department visits
  • Are not different in their use of prescription asthma medications
How Do We Interpret These Findings?

- Study design and data show only relational, not causative results
- Results do support other study findings
- Additional data (e.g., specific Rx asthma medications; details re asthma Sx, episodes, etc.) would be helpful
- Prospective study designs and more precise definitions of variables are needed
Acknowledgments

► Bob Woldman (Currently: Conceptual MindWorks, Inc., Air Force Medical Support Agency)

► State Center for Health Statistics, Division of Public Health, N.C. Department of Health & Human Services

The authors dedicate this presentation in memory of Janet Reaves.
Contact Information

Winston Liao
Asthma Program
N.C. Division of Public Health
5505 Six Forks Road, MSC 1915
Raleigh, NC 27699-1915
Tel: 919 707 5210
Winston.liao@ncmail.net