ASSOCIATION BETWEEN BMI AND HEALTH CARE EXPENDITURES USING THE 2002 MEDICAL EXPENDITURE PANEL SURVEY. Valderrama A, MBA; and Lawrence L.W. PhD, College of Pharmacy, The University of Louisiana at Monroe, Monroe, LA 71209-0470

BACKGROUND
- The number of overweight and obese Americans has continued to increase since 1960, a trend that is not slowing down.
- Approximately 127 million adults in the U.S. are overweight, 64.5 percent of U.S. adults. \(^1\)
- About one third of the adult population (80 million) are obese, and 9 million are severely obese. \(^1\)
- The total direct and indirect costs attributed to overweight and obesity amounted to $117 billion in 2002. \(^1\)
- According to a study of national costs attributed to both overweight (BMI 25-29.9) and obesity (BMI greater than 30), medical expenses accounted for 9.1 percent of total U.S. medical expenditures in 1998. \(^1\)
- Many research studies show association between obesity and medical spending in the United States.
- However, these studies possess two types of constraints: First, these studies do not control for some demographic variables. Second, others do not use the appropriate statistical analysis.
- Many studies only use general linear regression models or ordinary least squares with logarithmic transformation of the dependent variable to study the associations between obesity and expenditures.
- GDL regression model assumes that all cases have equal error variance (homoscedasticity).
- Expenditure data violates this assumption. Expenditure data is usually highly skewed to the right and contains too many zeros.

OBJECTIVE
The main objective was to determine whether there was a significant association between Body Mass Index scale (underweight, normal, overweight, moderate obesity, severe obesity, and very severe obesity) and national medical expenditures (dependent variable) for persons, 18 to 65 years of age, controlling for demographics of gender, race, marital status, and education in 2002.

METHODS

STUDY DESIGN
Retrospective cross-sectional analysis of the 2002 Medical Expenditure Panel Survey (MEPS), a nationally representative survey of the U.S. civilian non-institutionalized population, constituted the data set for analysis.

MEPS comprised 3 components: the household component (HC), the medical provider component (MPC), and the insurance component (IC).

The HC was the core survey and included data on demographic characteristics, health conditions, health status, use of medical services, health care expenditures, health insurance coverage, income, and employment among eligible individuals and their households.

RESULTS

Average Health Care Expenditures for BMI Categories

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>Average Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>$1,292.64</td>
</tr>
<tr>
<td>Normal</td>
<td>$2,571.64</td>
</tr>
<tr>
<td>Overweight</td>
<td>$2,895.55</td>
</tr>
<tr>
<td>Obese 1</td>
<td>$3,191.62</td>
</tr>
<tr>
<td>Obese 2</td>
<td>$3,875.62</td>
</tr>
<tr>
<td>Obese 3</td>
<td>$4,413.62</td>
</tr>
</tbody>
</table>

The average cost of health care expenditures was significantly higher for those with a BMI greater than 30 compared to those with a BMI less than 25.

INTRODUCTION TO REGRESSION ANALYSIS
- The exponential form for the two-part model is as follows:
  \[
  y = \exp(\beta^T x + \gamma) 
  \]
- Gaussian, Poisson, and Gamma distributions.

METHODS (Continuation)

INCLUSION AND EXCLUSION CRITERIA
- Respondents older than 18 and below 65 years old were classified as overweight, moderate obesity, and severe obesity based on BMI.
- Patients who smoke, have a history of coronary disease, stroke, human immunodeficiency virus, or cancer were excluded from the study.
- BMI: Body Mass Index was defined as body weight in kilograms divided by the height in meters squared.
- Expenditures: was defined by MEPS as the sum of direct payments for care provided during the year, including out of pocket payments and payments by private insurance, Medicare, Medicaid, and other sources.
- Demographics included age, gender, race, type of insurance, and educational level.

STATISTICAL ANALYSIS
- Statistical analysis was performed in SAS v. 8. The final dataset contained 10,490 subjects.
- A two-part model was used to analyze the association between obesity and health care expenditures.
- The first part was a binary model that dealt with the presence of zero mass (too many zeros). The second part was a continuous model with only positive expenditures.
- In this model, our independent variables were BMI and demographics and our dependent variable was total expenditure.
- A Park's Test was performed to find out to which distribution family fit the data. This step was not performed by any of the studies in the literature review.
- We adjusted this model by the demographic variables of type of insurance, gender, age, race, and marital status.

CONCLUSIONS
- Body Mass Index has a great impact on total health care expenditures.
- A two-part model is the most appropriate in predicting health care expenditures. Gaussian is the distribution shape of health care expenditures for this particular population.
- Age, Race (Black and Other), and marital status (never married) were also significant variables.

REFERENCES