Relationship Between Serum Cholesterol Determination and Yearly Family Income

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Business Statistics I
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July 30, 2009
I. Introduction

Elevated serum cholesterol is a risk factor in the development of atherosclerotic vascular disease. When atherosclerotic vascular disease involves the coronary or cerebral circulation, it predisposes to heart attack or stroke. A program of diet, exercise, and medication has been shown to reduce serum cholesterol, decreasing the incidence of both heart attack and stroke. Both primary and secondary prevention programs emphasize the importance of serum cholesterol determination.

An assessment of serum cholesterol is associated with the cost of a physician visit and laboratory test. Such costs may deter lower income individuals from undergoing serum cholesterol assessment. The purpose of this study is to explore the relationship between selected individuals ever having had their serum cholesterol checked and yearly family income.

II. Data

DataFerrett was used to abstract the study sample from the National Health and Nutrition Examination Survey conducted in 1994. The National Health and Nutrition Examination Survey (NHANES) is a program of studies designed to assess the health and nutritional status of adults and children in the United States. Begun in the early 1960’s, the survey has been conducted as a series of efforts focusing on different population groups or health topics. The survey is unique in that it combines interviews and physical examinations. NHANES is a major program of the National Center for Health Statistics which is part of the Centers for Disease Control and Prevention and has the responsibility for producing health statistics for the Nation.

The NHANES search was based upon two main variables and three control variables:

Main Variables:

1. The dependent variable was HAE6. This variable included the response to whether the individual had ever had their cholesterol checked. A No response was coded as 0; a Yes response was coded as 1.

2. The independent variable was HFF19R. This variable recorded yearly family income.

Control Variables:

1. The variable DMARACER was used to limit the selection to African-Americans only.

2. The variable HSSEX was used to limit the selection to males only.
3. The variable HFHAGER was used to limit the selection to individuals 35 to 55 years of age only.

The database search yielded 965 records satisfying the selection criteria. Yearly family income ranged from $0 to $50,000 or more. Yearly family income was separated into three samples:

1. A low income sample, defined as yearly family income of $0.00 to $20,000. This group included 450 records and was coded as 0.

2. A middle income sample, defined as yearly family income of $20,000 to $30,000. This group included 148 records.

3. A high income sample, defined as yearly family income of $30,000 to $50,000 or more. This group included 367 records and was coded as 1.

The middle income sample accounted for 15.3% of the overall sample size and was excluded from the study. This provided for two distinctly different samples with regard to yearly family income. Exclusion of 15.3% of the overall sample’s records was believed to have a negligible effect on the validity of the analysis.

The final sample consisted of 817 African-American males aged 35 to 55 years. Four hundred fifty comprised the low income sample and 367 comprised the high income sample.

III. Descriptive Statistics

The sample data were crosstabulated with the Yes (1) / No (0) response to “ever having had serum cholesterol checked” appearing in the rows and yearly family income appearing in the columns. Minitab® Student Release 14 was used for all computations.

<table>
<thead>
<tr>
<th>Table 1.</th>
<th>Cholesterol Checked versus Yearly Family Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Low Income (0)</strong></td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
</tr>
<tr>
<td>Chol. Checked (0)</td>
<td>325</td>
</tr>
<tr>
<td>Chol. Checked (1)</td>
<td>125</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
</tr>
</tbody>
</table>

As shown in Table 1, of the 450 African–American males 35 to 55 years of age comprising the low income sample, 125 or 27.78% had ever had their serum cholesterol checked. Of the 367 African-American males comprising the high income sample, 197 or 53.68% had ever had their serum cholesterol checked.
The crosstabulation results may also be presented in bar graph and pie chart format.

![Figure 1](image1)

**Figure 1  Cholesterol Checked versus Yearly Family Income**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Income</td>
<td>350</td>
</tr>
<tr>
<td>Low Income</td>
<td>250</td>
</tr>
</tbody>
</table>

Panel variable: Yearly Family Income

![Figure 2](image2)

**Figure 2  Cholesterol Checked versus Yearly Family Income**

Panel variable: Yearly Family Income

The crosstabulations suggest that the proportion of individuals in the low income sample who had ever had their serum cholesterol checked appeared to be less than the proportion of individuals in the high income sample who had ever had their serum cholesterol checked.
IV. Hypothesis Test

A statistical test was conducted to evaluate whether the proportion of low yearly family income African-American males aged 35 to 55 years who had ever had their serum cholesterol checked was less than the proportion of high yearly family income African-American males aged 35 to 55 years who had ever had their serum cholesterol checked.

This question may be formulated in terms of a null and alternative hypothesis as follows:

\[ H_0: \ p_0 - p_1 \geq 0 \]
\[ H_A: \ p_0 - p_1 < 0 \]

Since the data involved human behavior, the level of significance was chosen as \( \alpha = 0.05 \). Comparison of the two proportions involved computations based upon the z-test with determination of an associated p-value.

The results of the computations appear in Table 2.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>z</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_0: \ p_0 - p_1 \geq 0 )</td>
<td>-7.54</td>
<td>0.000</td>
<td>Reject ( H_0 )</td>
</tr>
</tbody>
</table>

The outcome of the hypothesis test was based upon comparison of the calculated p-value with \( \alpha \) as follows:

For \( p < \alpha \), Reject \( H_0 \)
For \( p \geq \alpha \), Fail to Reject \( H_0 \)

The p-value of 0.000 < \( \alpha = 0.05 \) led me to reject the null hypothesis (\( H_0 \)).

V. Conclusion

In conclusion, for \( \alpha = 0.05 \) level of significance, the proportion of low yearly family income African-American males aged 35 to 55 years who had ever had their serum cholesterol checked was significantly less than the proportion of high yearly family income African-American males aged 35 to 55 years who had ever had their serum cholesterol checked.

Given the benefits of serum cholesterol reduction in those with elevated serum cholesterol in both primary and secondary prevention of heart attack and stroke, public health authorities should consider a program targeted toward low yearly family income African-American males aged 35 to 55 years. Such a program should involve identification of these individuals on a state by state basis followed by a mailing recommending determination of serum cholesterol through their local County Health Department.