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Obesity, Educational Attainment, and State Economic Welfare

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Abstract

For the first time in history, estimates of the overweight people in the world rival estimates of those malnourished. The World Health Organization (WHO, 2002) ranked obesity among the top 10 risks to human health worldwide. In the early 1960s, nearly half of the Americans were overweight and 13% were obese. Today some 64% of U.S. adults are overweight and 30.5% are obese. Even more alarming, twice as many U.S. children are overweight than were twenty years ago, a 66% increase. Non-communicable diseases impose a heavy economic burden on already strained health systems. Health is a key determinant of development and a precursor of economic growth (WHO, 2003). Previous research suggests that states with higher levels of educational attainment tend to be better off on measures of economic welfare (Post Secondary Opportunity, 2002). In the U.S. adults with less than a high school education have higher prevalence of both obesity (27.4%) and diabetes (13%), while adults with a college degree had prevalence of obesity of (15.7%) and diabetes (5.5%) respectively (CDC, 2002). This study explores the interrelationships among obesity prevalence, educational attainment, and state economic welfare. It is hypothesized that as a state's educational attainment rises, their corresponding obesity prevalence goes down.

This secondary analysis examines U.S. data from the Center for Disease Control, U.S. Census, and The Bureau of Economic Analysis for the year 2001. Fifty – one states (including D.C) were correlated with their obesity prevalence and high school graduation rates, bachelor's degree recipients or more, per capita personal income, poverty rate, median household income, unemployment rate, and employed/population ratio.

The growing body of literature on the globesity epidemic (world corpulence) suggests that individuals are not to blame, but globalization and development, with poverty as an exacerbating factor. Some of the problem in the U.S. and abroad might be partially economic, with mass-marketed foods being cheaper, especially in urban areas, while fresh foods are becoming more expensive. In poorer countries people tend to get fatter as their incomes rise, while in developed and transitional economies higher income correlates with more slender bodies. Cultural factors might also be important in that many minority and lower income groups associate fatness with prosperity, a perception not shared with groups having higher living standards and education.

Results show that states with a higher percent of the population 25 or older having at least a high school diploma are negatively correlated with Obesity Prevalence ($r = -.45$, $p<.001$). More striking were the percent of the population 25 or older having a bachelor's degree and the corresponding negative correlation with obesity prevalence ($r = -.55$, $p<.001$). Other correlations with obesity prevalence are: median household income ($r = -.46$, $p<.001$), per capita personal income ($r = -.47$, $p<.001$), poverty rate ($r = .38$, $p<.01$), unemployment rate ($r = .35$, $p<.05$) and employment/population ratio ($-.37$, $p<.01$). Findings seem to suggest that not only does obtaining bachelor's degree provide for a better economic life style, but possibly a slimmer healthier one as well. If states are to improve *minimum* living conditions and health (as related to

obesity) of their population, they ought to focus on high school graduation and increase the number of adults in their state who are at least high school graduates. However an "aiming high" state strategy would improve living standards well beyond minimum by increasing the proportion of the state adult population with at least a bachelor's degree. The indirect affect might be to lower state obesity prevalence as more of a state's population becomes better educated.

Keywords: obesity, education, economics, U.S. state data, unemployment, income

OBESITY, EDUCATIONAL ATTAINMENT, AND STATE ECONOMIC WELFARE

Introduction

The *Journal of the American Medical Association (2003)*, reported that the prevalence of obesity among U.S. adults climbed from 19.8% to 20.9% between 2000 and 2001, and diagnosed diabetes (including gestational diabetes) increased from 7.3 percent to 7.9 percent during the same one-year period. The increases were evident regardless of sex, age, race, and educational status. In 2001, 20 states had obesity prevalence rates of 15-19%; 29 states had prevalence of 20-24 %; and one state reported prevalence over 25% (CDC, 2004). The total cost of overweight and obesity is estimated at 120 billion. Strum (2002) states that obese individuals bear a substantial portion of medical costs. Obese individuals are spending approximately 36% more than the general population on health services and 77% more on medications.

It still remains unclear as to what type of problem obesity is and whom or what it affects? With near epidemic proportions in the United States and spreading world-wide, further understanding of the problem and its relationships to other social, educational, and economic systems need to be examined. Senge (1994) suggests that, fragmentation has forced people to focus on snapshots to distinguish patterns of behavior to explain past phenomena or to predict future behavior. He claims that this is not how the world really works: events do not dictate behavior; instead, they are the product of behavior. What really cause behavior are the interactions between the elements of the system.

In diagrammatic form:

Systems (patterns of relationships) ---> patterns of behavior ---> events (snapshots)

However, although reactive in nature, some starting point is needed to identify the components of the Obesity System, and the relationships between the components and elements of the system. If Senge is correct, the behavior of an obesity system could be understood to be a function of the structure and of the relationships between the elements of the system. We might observe patterns of behavior and predict future events, not only nationally, but possibly globally.

Postsecondary Education Opportunity (2002) states that an "aiming low strategy" (improving minimum living conditions) at the state level is to increase the proportion of adults that are at least high school graduates. On the other hand, if a state was to improve the living conditions will beyond the minimum, increasing the proportion of the population with at least a bachelor's degree was the appropriate "aim high strategy." Living conditions are taken broadly to mean one's general health (freedom from illness and disease), income, and welfare. Specifically, three hypotheses are considered: (1) the higher state's educational attainment, the lower the level of obesity prevalence, (2) states with higher obesity prevalence also have higher rates of unemployment and poverty, and (3) states with higher obesity prevalence have lower personal and family incomes.

Background

Research states that 31% percent of adults 20 years of age and older (some 59 million people) are considered obese (BMI of 30 or more). Also among children 6 to 19, 15% (almost 9 million)

are overweight according to 1999-2000 data; nearly triple the population in 1980. United States Health Human Services Secretary Tommy G. Thompson (2002) states "the problem keeps getting worse." He goes on to say, "obesity increases a person's risk for a number of serious conditions, including diabetes, heart disease, stroke, high blood pressure and some types of cancer." Further findings show more adult women are obese (33%) than men (28%), with non-Hispanic black women (50%), Mexican-American women (40%) and non-Hispanic white women (30%) comprising the larger proportions. Men's levels of obesity showed little or no difference among race/ethnicity. However, African Americans had higher prevalence rates of both obesity (31.1%) and diabetes (11.2%) than did members of other racial and ethnic groups. More than one-third of obese children also exhibit abnormal sleep which may lead to impaired learning and school performance (Yanovki, 2002). Children who are overweight and obese grow up to be overweight and obese adults carrying greater risk of major health problems of diabetes and heart disease (HHS, 2002).

Education

Also, people with less than high school education had higher prevalence of both obesity (27.4%) and diabetes (13%) than people who had a high school education (CDC, 2004). Individuals and families with more education have more income and higher living standards than do people with less education. In the United States, states with higher levels of educational attainment tend to be better off on measures of economic welfare, while states with lower levels of educational attainment tend to be worse of on the same measures (Postsecondary Education, 2002). States with a relatively high proportion of their populations with at least a high school diploma are most likely to have a high proportion of their population 16 years and older employed ($r = .738$). A state where the proportion of the population with a bachelor's degree is the highest correlates positively with the state's per capita personal income ($r = .783$). A strong positive relationship exists between states with higher proportions of adults with bachelor's degrees tend to have higher median household income than do states with lower levels of bachelor's degree attainment ($r = .656$). Overall, states where the proportion of the population with a bachelor's degree is the highest tend to have higher incomes, both for individuals and families (Postsecondary, 2002).

Food Economics

Over the past twenty years, fast food consumption has increased to account for more than 40% of income spent on food (Bloomgarten, 2002). Drewnowski (2004) suggests that a consumer approach looking at taste, cost, convenience, health, and variety. Nutrient dense foods versus energy dense foods are not perceived by consumers per se (especially those with little education). Children for example like sweet and reject bitter tastes, they prefer energy dense foods to those of low energy density, and that energy dense foods are both more palatable and often less expensive in dollars per kilocalorie. Energy density of foods is directly driven by decreasing water and increasing fat content, with carbohydrates playing a minor role. Sugar consumption and obesity are highly associated, accounting for 12% to 20% of daily energy. In current world prices sucrose is one of the least expensive foods available providing 19,000 kcal per dollar. Foods in natural sugar are much more expensive. "Health diets according to Drewnowski, "cost more" and diet quality is linked to socio-economic status. From this we might in certain ways consider obesity an economic issue and possibly inquire, research, and address it as such.

A nutrition transition of sorts is taking place where societies everywhere are moving away from traditional methods of preparation and local foods in favor of mass-produced process foods that are generally higher in fat and calories (energy dense) and lower in fiber and micronutrients. The issue here is not just "junk foods"; once again it is economic for the most part. Mass-marketed foods are getting cheaper, particularly in urban areas, while fresh foods are becoming more expensive. Many of the poorer population are forced by their limited resources to eat less healthy foods. Coupled with the nutrition transition new patterns of work, transportation, and leisure have people everywhere leading less active sedentary lives. Lower income groups have access to such conveniences as television, telephones, and cars, leading to sedentary habits and changes in lifestyle which further contribute to the problem. Some minority and lower income groups' associate fatness with prosperity, however, this perception is not shared in more prosperous and more educated sectors of society. In developing countries the relationship between socioeconomic status and obesity is positive for men but negative for women (Health, 2002).

Diseases of Civilization

Diseases of Civilization, or degenerative diseases, are a result of an inappropriate relationship of people with their environment. These new diseases spring from lifestyles allowed by modern society. They take years to develop, and once encountered do not lend themselves easily to cure. They appear to become ever more widespread as countries become more industrialized. (Perspectives, 2004). Degenerative diseases are different from other diseases because they are lifestyle diseases that are potentially preventable, and can be lowered with changes in diet, lifestyle, and environment.

Diseases of Civilization are the top ten causes of death past the age of 45. Some of the diseases of civilization include cancer, rickets, dental caries, obesity, drug addiction, high blood pressure and heart disease. Do Diseases of Civilization really exist? There are two basic lines of evidence that support the existence of Diseases of Civilization: (1) the international variation in cancer rates, and (2) Death statistics in the United States.

> *"These observations suggest that the diets [or lifestyle] of different populations might partly determine their rates of cancer, and the basis for this hypothesis was strengthened by results of studies showing that people who migrate from one country to another generally acquire the cancer rates of the new host country, suggesting that environmental [or lifestyle factors] rather than genetic factors are the key determinants of the international variation in cancer rates*" (Key, 2002).

An analysis of the death statistics of the United States reveals some interesting facts that tend to support the existence of the Diseases of Civilization.

In 1900, the top three causes of death in the United States were pneumonia / influenza, tuberculosis, and diarrhea/enteritis. Back then communicable diseases accounted for about 60 percent of all deaths. In 1900, heart disease and cancer were ranked number #4 and #8 respectively. Since the 1940's, most deaths in the United States have resulted from heart disease,

cancer, and other degenerative diseases. And, by the late 1990's, degenerative diseases accounted for more than 60 percent of all deaths (NHSC, 2003; Mokdad et al., 1999, 2000, 2001, 2003)

While obesity is nationally (and globally) on the rise, its underlying dynamics vary across regions. *In poor countries people tend to get fatter as their incomes rise, while in developed and transitional economies, higher income correlates with slimmer populace"*(Eberwine ,2002*).* Quite possibly the United States is a leader by example (negatively) in what constitutes a higher standard of living. Prosperity and higher standards of living should not connote with obesity and its associated health burdens and risks. The purpose of this study is to examine the relationships and interrelationships between obesity prevalence, educational attainment, and economic welfare of the United States. Educational attainment is clearly linked to income and living standards.

Using the current literature as a starting point, the basic problem explored is what relationship exists among a states' obesity prevalence, its educational attainment, and economic welfare. A series of hypotheses were developed. The literature suggests that there might be a relationship between education and obesity. Are many of the states with lower rates of education, also more obese, have lower incomes, and higher rates of unemployment and poverty? Does college degree attainment seem to have an effect on its obesity prevalence, while increasing income, lower unemployment and poverty rates, and raise the general standard of living? These questions prompted the following hypotheses:

Hypotheses:

H1: The less a state is educated, the more obese a state is.

H2: As a state's number of college graduates increases obesity prevalence goes down.

H3: As personal income rises, a state's obesity prevalence goes down.

H4: As the median household income (used as a family economic measure) rises, a state's obesity prevalence goes down.

H5: As a state's poverty rate rises, so does obesity prevalence.

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H6: As unemployment rate rises, so does a state's obesity prevalence.

H7: As employed/population ratio rises in a state, the state's obesity prevalence goes down.

Method

Sample Data

This study use the following secondary sources found in public domains on the World Wide Web (www).

This study's examination of states 'obesity (BRFSS, 2001) as it relates to education attainment as high school graduation rates and college graduation within the state (http://www.census.gov/population/wwwsocdemo/educ-attn.html, 2003). Data were also obtained from several on-line databases. Five measures of a states 'economic welfare: per capita personal income (http://www.bea.doc.gov/bea/regional/data.htm, 2003), median household income (http://www.census.gov/hhes/www/income.html, 2003), poverty rate (http://www.census.gov/hhes/www/poverty.html, 2003), unemployment rate (http://www.bls.gov/lau/home.htm, 2003) and employed/population ratio (http://www.bls.gov/lau/home, 2003).

Measures

BMI is a common measure expressing the relationship (or ratio) of weight-to-height. It is a mathematical formula in which a person's body weight in kilograms is divided by the square of his or her height in meters (i.e., wt/ (ht) ². The BMI is more highly correlated with body fat than any other indicator of height and weight (NRC, 1989, p.563). Individuals with a BMI of 25 to 29.9 are considered **overweight**, while individuals with a BMI of 30 or more are considered **obese**. The United States (including D.C.) is the sample data (N = 51), using the "state" as the unit of analysis.

Limitations

Pirie ET. al. (1981) state that there is distortion in self-reported data on height and weight. On average woman report weights lower than actual with the amount of discrepancy increasing as weight increased. At lower weights, men on the average reported weighing more than there actual weights, while at the higher weights reported weighing less.

Results

Table 1 displays the inter-correlations of all variables used in the study.
Results show that states with a higher percent of the population 25 or older having at least a high school diploma are negatively correlated with Obesity Prevalence ($r = -.45$, $p<.001$). More striking were the percent of the population 25 or older having a bachelor's degree and the corresponding negative correlation with obesity prevalence ($r = -.55$, $p<.001$). Other correlations with obesity prevalence are: median household income ($r = -.46$, $p<.001$), per capita personal income ($r = -.47$, $p<.001$), poverty rate ($r = .38$, $p<.01$), unemployment rate ($r = .35$, $p<.05$) and employment/population ratio ($-.37$, $p<.01$).

Findings seem to suggest that not only does obtaining bachelor's degree provide for a better economic life style, but possibly a slimmer healthier one as well. The state data (2001) suggests that each hypothesis is supported at the .05 level or lower.

Table 1
Inter-correlations of Obesity Prevalence, Educational Attainment, and State Economic Welfare 2001

	Obesity	CompHS	Bach	PerCap	Poverty	MedianInc	Unemp	Emp_Pop
Obesity	1.00	-0.45	-0.55	-0.47	0.38	-0.46	-0.35	-0.37
CompHS	-0.45	1.00	0.34	0.27	-0.66	0.48	-0.34	0.71
Bach	-0.55	0.34	1.00	0.80	-0.40	0.69	-0.15	0.37
PerCap	-0.47	0.27	0.80	1.00	-0.49	0.75	-0.14	0.30
Poverty	0.38	-0.66	-0.40	-0.49	1.00	-0.77	0.47	-0.75
MedianInc	-0.46	0.48	0.69	0.75	-0.77	1.00	-0.22	0.57
Unemp	0.35	-0.34	-0.1	-0.14	0.47	-0.22	1.00	-0.55
Emp_Pop	-0.37	0.71	0.37	0.30	-0.75	0.57	-0.55	1.00

Note. 2001 data, there are no p-values here for the correlations.

Discussion

Obesity is related to educational attainment and state economic welfare. Efforts at the state level, by health programs and interventions, as well as health care providers can have a beneficial effect for its residents. Education (as one can see from the results) is very important and can provide the necessary knowledge and skills needed at the individual level to understand obesity, BMI, k-calories, physical activity, and food consumption. Obesity is also moderately related per capita income, and median income meaning that as obesity levels go down income rises somewhat at both the family and individual levels. Employment and obesity are also slightly related in that persons unemployed are slightly more obese, and as more persons have employment the state obesity takes a downward trend.

This secondary analysis of data is not without limitations. First, data from their original sources were collected for a specific purpose. Using the data from different sources for different purposes raises the question of validity of such method. Also correlation should not be considered causation, none of these variables "cause" obesity but might be related to it. Summary statistics… especially averages suppress individual variation and may inflate the correlation coefficient. There may some relationship even when there is no linear correlation. In the Appendixes that follow, note that the line of best fit of the data is not parallel to the x-axis meaning there is some slope or some relationship between the variables. This analysis did not test if the slope was different from zero for each independent variable. The variable issue of moderation and mediation may also be present. In causal studies (which this study is not), this is called the" third variable problem". A third variable has some relationship with the other two in a particular analysis, sometimes "moderating" or" mediating" the original relationship of the original two variables. For example educational attainment might affect income which in turn affects obesity (maybe more money to buy more food of the wrong types, etc.).

Hopefully, this secondary research might provide interest to conduct primary research. Primary data collection studies with ample sample sizes and statistical power might shed light on obesity and its relationship with education and economic indicators.

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**Note.*All references listed here informed the study. Unfortunately, not all Web links are still active.

Appendix A

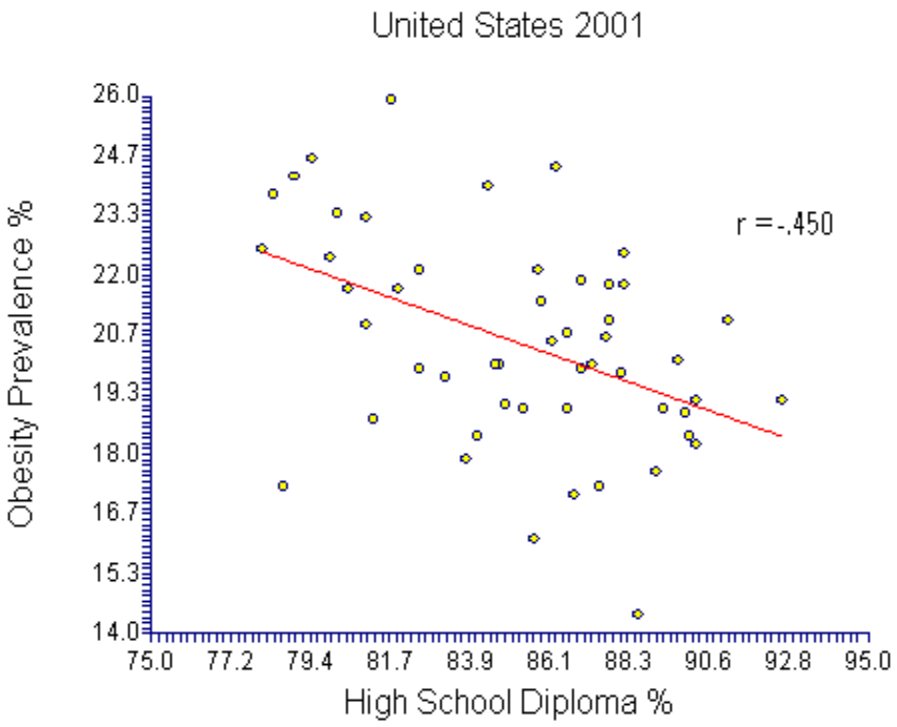

Figure 1.
Figure 1displays the United States obesity prevalence as compared percent of the population age 25 and over that has at least a high school diploma (r = -.450).

Appendix B

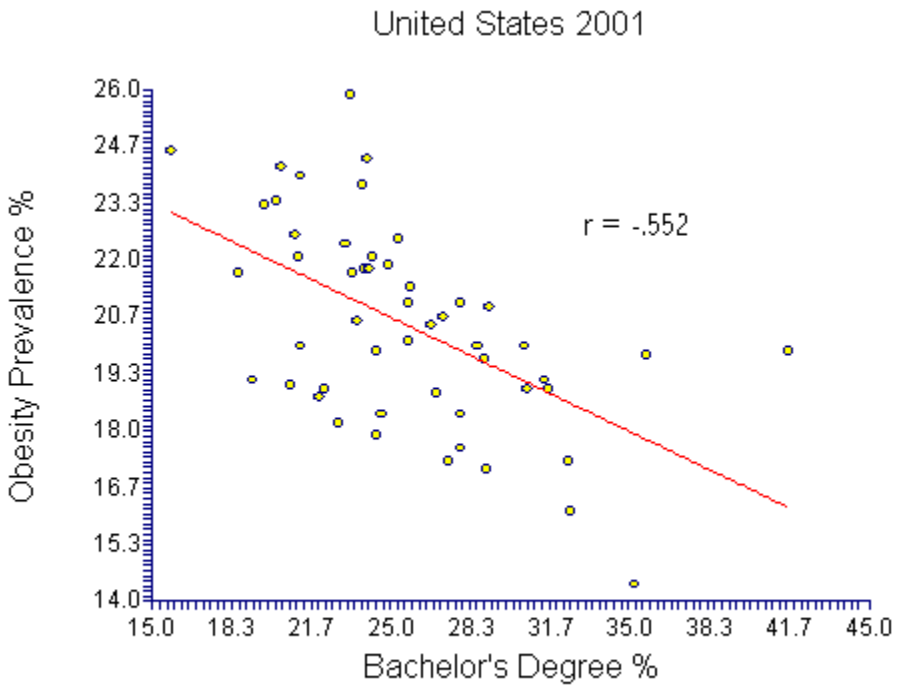

Figure 2.
Figure 2 displays the United States in 2001, examining the relationship between obesity prevalence and the percent of the population age 25 and over that has a bachelor's degree or more from a college or university. Amongst all the variables tested this relationship was the strongest indicating that as education at the college level increases in a state the obesity prevalence drops (r = -.552).

Appendix C

Figure 3.

Obesity prevalence and per capita personal income is depicted in figure 3. As personal income rises obesity correspondingly is lower in the state (r = -.475).

Appendix D

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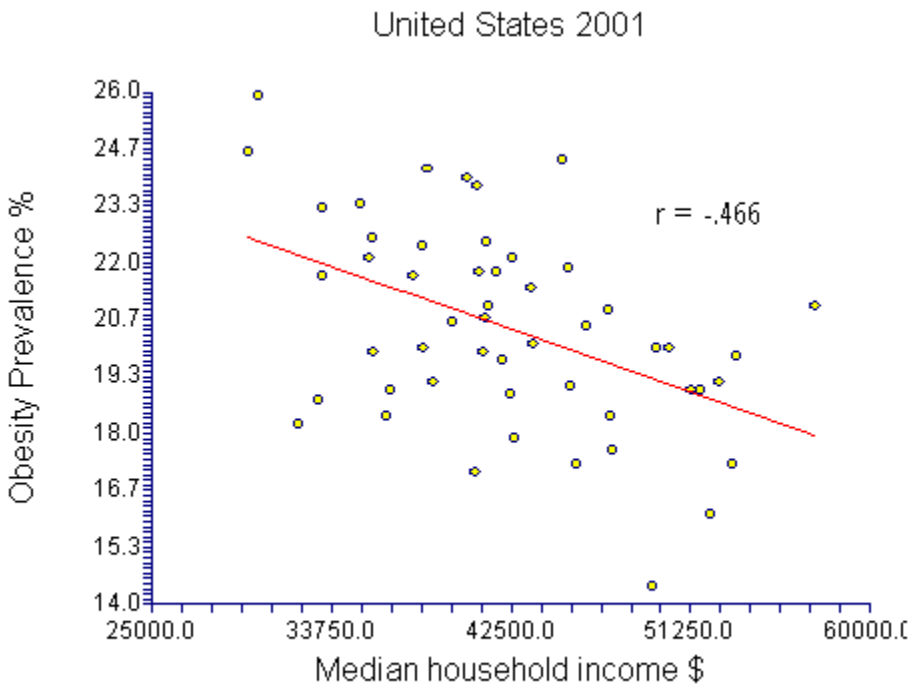

Figure 4.
As median household income rises obesity prevalence is corresponding lower for the state (r = -.466).

Appendix E

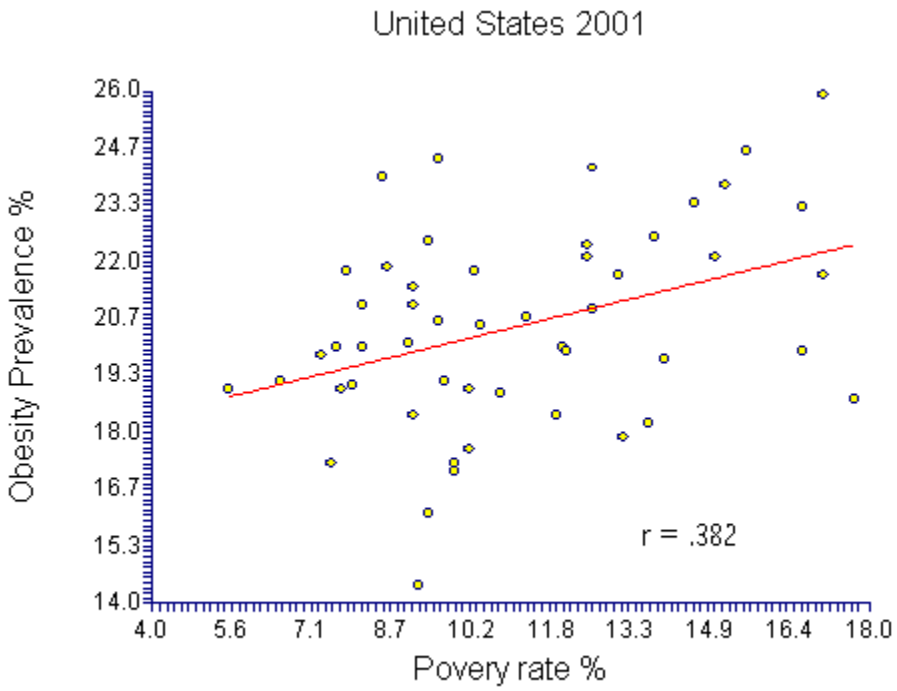

Figure 5.
Figure 5 shows obesity prevalence in the United States and its relationship with a state's poverty rate (r = .382). As one might expect, as poverty increases there is a rise in obesity.

Appendix F

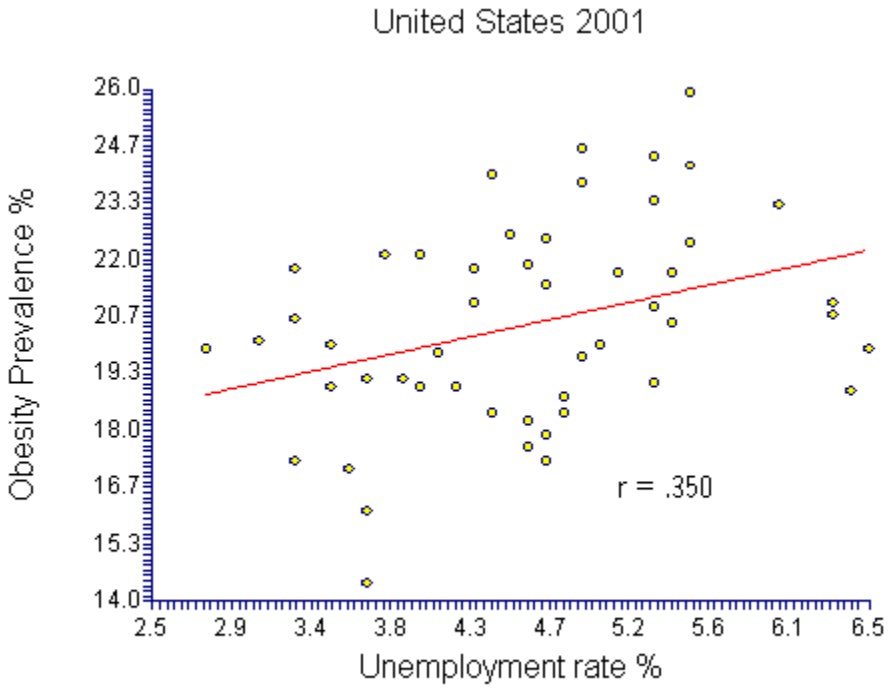

Figure 6.
Unemployment rate in the United States as compared to obesity prevalence shows a slight rise over the United States (r = .350). This finding is similar to the poverty rate as well.

Appendix F

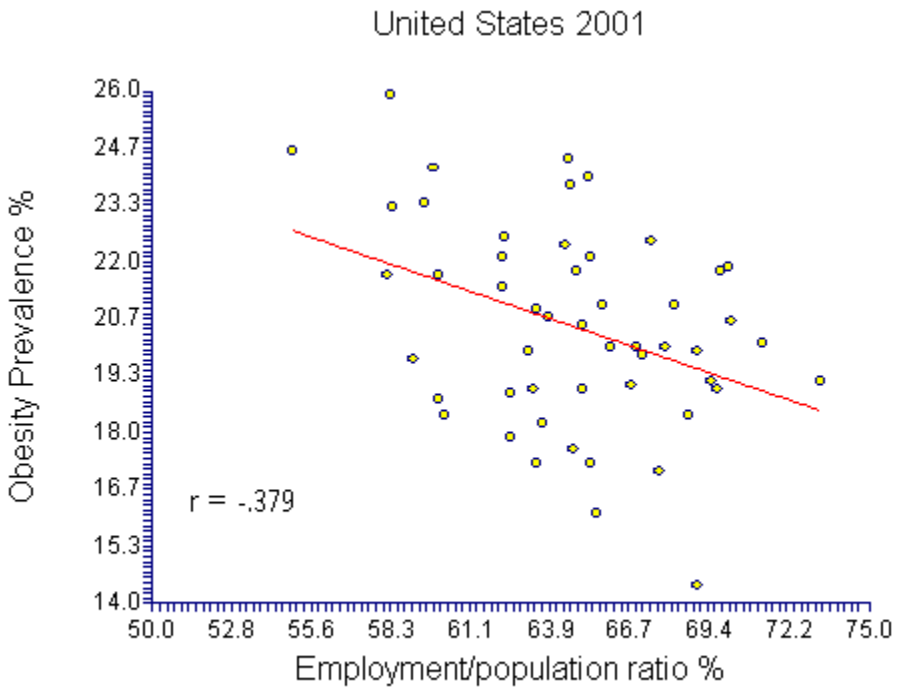

Figure 7.
Figure 7 displays the employment/population ratio and its relationship to obesity prevalence (r = -.379). Again, as one might expect, employment/population ratio is closely related to the poverty rate and unemployment rate.