Bittersweet Effects of Soda: Regular vs. Diet

Investigating the negative health problems of adults and college students due to artificial sweeteners over a decade

**Tag Words**: Aspartame, Diet soda, NutraSweet, Weight Gain, Cravings, Metabolic Syndrome, PKU, BMI, Artificial Sweeteners, Aspartate, Methanol, Phenylalanine, Formaldehyde, and Type II diabetes

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**Summary**
Individuals consume diet soda and thoroughly believe it is healthy and safe. However, the chemical sweeteners, like aspartame, it contains can lead to complications down the road. Complications range from weight gain to diabetes, and more. Adult diet soda drinkers will be anonymously surveyed in order to determine if there is some sort of correlation between consumption of diet soda and the aforementioned complications. These results will be compared with young adult, ages 18 and up, diet soda consumers. (FI)

Video Link [http://youtu.be/4dCIRqcMIKw](http://youtu.be/4dCIRqcMIKw)
Abstract (FI)

Is diet soda really much healthier than regular soda? This is the main focus of this investigation. While it is widely thought that diet soda is a much better choice than regular soda that may not be the case. For instance, diet soda contains sweeteners, like aspartame, which are not fully understood by most consumers. Do these chemicals have negative effects on our bodies? And if they do, will they appear immediately, or after some time? These are all valid questions that should be answered. And these answers should be made clear to the vast population of soda consumers. In order to assess the consequences, whether they are positive or negative, of drinking diet soda people will be surveyed. The surveys will be approximately ten questions long, but it will be thorough enough to draw conclusions from the data. (FI)

History (AP)

The soft drink that is also known as soda pop or plainly as soda is a beverage containing flavoring agent, water, and sweeteners. The unique flavor and the refreshing quality of the beverage arises when there a balance between the flavor and carbonation of the drink. However, despite the preference in taste, the sparkling beverage comes in a variety of forms which includes regular, caffeinated, caffeine-free, low-calorie, and no-calorie drinks [3]. The rise of regular soda appeared in the late 1870s and increased exponentially in the 1920s with the invention of vending machines that made the cold drinks easier to access through the self-service machines [3,4]. As the demand for soft drinks began to rise, so did the flavors and ingredients for the soft drink production. The ingredients of soft drinks consist of mixing dry and fresh ingredients such as oranges and lemons for flavor in a syrup mixture with carbonated water. The unique flavor and refreshing quality of the sparkling beverage caused by carbonation gives the biting taste that is a feature causing the popularity of soft drinks.

Progression of Artificial Sweeteners to the Final Product (AP & FI)

With the increased demand for soft drinks, diet sodas were formulated as an alternative product that had the intent on targeting a different audience. Initially, diet sodas were designed for diabetics and health-conscious people; however, the popularity increased when the focus shifted to people who desired to lose weight with a reduced calorie drink. Through the use of multiple artificial sweeteners, diet soda has the sweetened taste without the added sugar [15]. On the contrary, the opinion is mixed to the taste and preference of the diet soda. For instance, the opinion of some people is that diet soda lacks the taste of regular sweetened soft drinks, while other people claim that the taste of diet soda is similar to regular soda. The first artificial sweetener introduced was cyclamate but was discontinued due to a government ban. As a result, cyclamate was considered to have carcinogenic potentials as cancer was seen in lab mice during experimental studies [8,12]. Next, the reformulated diet soda contained saccharin but the production decreased because a study was released declaring the sweetener to be a possible carcinogen [12]. Furthermore, saccharin was criticized by consumers who claimed the sweetener has a chemical and bitter aftertaste. In 1981, NutraSweet, also known as aspartame was introduced, which is the current sweetener in many of diet products on the market today [8]. In conclusion, through the chain of events that began with the ban of cyclamate, aspartame was developed that would lead into the one of the most studied food ingredients by the FDA. (AP)
It seems a bit farfetched that the government and FDA would allow such a potentially hazardous substance to be injected into our foods and drinks. However, the allure of making millions in profits blinded those in charge. Therefore, the unfortunate addition of Aspartame did occur and now it is thriving. In some places, it is harder to find products without it than it is to find some with it. It is found in 6,000 products and is consumed by at least 250 million people. Since Aspartame was never tested on humans, these 250 million consumers are the test subjects for this mysterious substance [2,9]. For the negative stigma associated with artificial sweeteners and diet soda, there are studies that go against the norm and stick up for these products. Diet sodas can actually help with immediate weight loss, whereas regular sodas would only add more calories to an individual’s diet. It seems as if there is just a general assumption that diet sodas only lead to weight gain, obesity, and other health concerns. However, as mentioned above, studies show that drinking diet soda while on a regular diet can help with weight loss. For instance, researcher Barry Popkin, PhD, claims that “people who drink artificially sweetened sodas as part of a calorie-restricted diet lose weight.” So, one can only assume that if a person is on a diet, exercises, and consumes diet soda they will lose weight. Therefore, diet soda and the artificial sweeteners they contain do not automatically cause a person to gain weight. There is no evidence to support the widely believed thought that diet soda definitely leads to weight gain (FI).

Biochemistry: Aspartame Structure (AP)

Aspartame is considered a methyl ester that is connected together by a dipeptide of the two natural amino acid structures of L-phenylalanine and L-aspartic acid. The chemical synthesis of the artificial sugar aspartame consist of two carboxyl groups located on the aspartic acid which are joined into an anhydride while the amino group is shielded from further reactions [1]. Next, the phenylalanine is methylated in order to be combined with the aspartic anhydride. Finally, the blocked amino group is removed by hydrolysis from the aspartic acid. The ending result yields the beta-form byproduct due to the carboxyl group from the aspartic acid linking to the phenylalanine [19]. Due to the chemical property, aspartame is two hundred times sweeter than the regular table sugar yielding a noticeable taste difference. As a result, the flavor of aspartame differs from sucrose based on the duration and onset of sweetness. The sweetness lasts a longer duration than sucrose but due to the peptide bonds, aspartame is easily hydrolyzed into the amino acid constituents at high pH and increased temperature [1,19]. Consequently, due to the proneness to degrade in products with a high temperature, aspartame is undesirable as a baking sweetener. Additionally, at an increased pH, the half-life decreases to a couple days on the shelf which causes manufactures to keep the soft drinks at a low pH value were aspartame can be reasonably stable with a longer shelf life [8,12,15].

Metabolic breakdown of Aspartame (AP)

Diet soda is often portrayed as a healthier alternative to regular soda, because of the advertising claim of the beverage containing zero calories; however, this is just a deception as more research is portraying the artificial sweetener to cause negative health problems. Due to lack of knowledge of the chemical and metabolism of aspartame, most diet soda drinkers are
lulled into a false sense of security that what they are drinking is indeed somewhat healthy. However, with all those chemicals that go into a can of diet soda, one might as well be drinking regular soda. Through the studies of aspartame ingestion, the compound breaks down into three residual components known as methanol, aspartic acid, and phenylalanine. Due to the essential amino acid phenylalanine, health precautions are needed for individuals born with phenylketonuria (PKU) which prevents phenylalanine from being metabolized leading to a build up in the blood, urine, and tissues. A mother who may be genetically predisposed to PKU should not ingest Aspartame during pregnancy. The byproducts of methanol can further breakdown into formic acid and formaldehyde. As a result, the focus of the adverse health effects is based on the three metabolites which consist of phenylalanine, aspartic acid, and methanol that are hydrolyzed in the small intestine [1,12,15]. Aspartate is a common amino acid in the typical daily diet and some researchers believe that aspartate, in conjugation with glutamate might lead to excitotoxicity that affects the nerve and brain cells [8]. The metabolite methanol is further broken down and converted into formaldehyde and formic acid by the metabolism of aspartame. The build-up of formic acid has been shown to be the cause of injury in methanol poisoning [2]. The reasoning that methanol is considered a primary mechanism of toxicity for methanol positioning is because of the long half life [12]. Lastly, the production of phenylalanine poses a concern because of a hypothesis that this amino acid in excess may alter neurotransmitter levels and affect many processes.

**Evaluation of the Safety of Aspartame: Approval** (AP)

Clinical studies have not shown the byproduct of aspartame to have toxic effects. This is due to an individual not being able to ingest a sufficient amount of glutamate and aspartic acid via drink and food to cause a toxic effect [1]. For instance, the data demonstrates that the amount of methanol produced from aspartame is less than the concentration from natural sources such as citrus fruits. The byproduct of methanol (formaldehyde) also is said to pose no health risks because the compound is rapidly converted and eliminated from the body with no increase concentration in the blood [1,2]. Finally, through the analysis of scholarly articles, there are no consistent findings which support the claim that phenylalanine will affect neuronal function. Thus, despite the widely circulated health scares and several controversies, the FDA declared that the food additive aspartame is safe while the Center for Disease Control supports the conclusion of the FDA by not finding epidemiological associations that cause harm [2,19].

**Safety of Aspartame** (FI)

Aspartame is one of the most controversial substances that people consume nowadays. There have been studies and scientists claiming that it is unsafe, and while some still believe that the FDA has stuck by aspartame. In fact, FDA officials claim aspartame is “one of the most thoroughly tested and studied food additives the agency has ever approved.” Clearly the FDA is confident in the safety of this chemical. Other food regulatory agencies worldwide (90 countries), have found aspartame safe for humans. The European Commision’s Scientific Committee on Food also assessed the safety of aspartame. And they found in excess of 500 papers published between 1988 and 2001. Studies have been conducted on animals as well as humans. And the human studies were conducted on a many types of people. For instance, “It has been studied in animals, in various human populations including infants, children, women, obese
adults, diabetics, and lactating women.” With nearly all types of people being tested and having ruled out symptoms such as headaches, seizures, allergic reactions, etc. questioning the safety of aspartame seems somewhat foolish.

Of course there have been studies and experiments conducted that claim aspartame is in fact harmful. However, these studies have been discredited and have been refuted. For example, a new rat study conducted by the Ramazzini Foundation in Italy seemed to show a linkage between aspartame and tumors. However, the European Food Safety Authority reexamined the Ramazzini’s data and upon their scrutiny mistakes were spotted. These errors ultimately led to the Ramazzini studies being discredited. And in fact, they updated their public opinion in 2009. They claimed that there is no suggestion of any carcinogenic potential in aspartame. This is just one example of how aspartame’s safety was questioned, but was still found safe. Another backing of the safety of aspartame came from the New England Journal of Medicine. They conducted a study using individuals who reported having ill-effects upon ingesting aspartame. The New England Journal of Medicine found that when these people knew what they were ingesting all of them experiences headaches afterwards. However, in a double-blind trial, it was found that when these people did not know what they were consuming, only 35% of them had headaches after ingesting aspartame. And 45% of these people had gotten headaches after ingesting a placebo. So clearly what the New England Journal of Medicine demonstrated was that this negative stigma associated with aspartame can influence how people feel. Ultimately, what remains to be seen is anything substantial undermining aspartame’s safety.

Research: Artificial Sweeteners Consumption in Adults

With the incidence of obesity reaching epidemic proportions, research is showing that there has been an increased percentage of the population who are consuming artificial sweeteners such as aspartame [2,10]. Drinking diet soda to lose weight is achieved but long term ingestion of aspartame may negatively impact proper weight control. Scholarly articles have been published examined the effects of artificial sweeteners on body weight. One of the first research studies came out in 1986 from the American Cancer Society which is a couple of years after NutraSweet came into market in 1984. The subjects included 78,694 women who were nearly similar in the category of ethnicity, age, and health status. The women were examined one year later to compare the weight gained of women with more regular artificial sweetener product intake. They found that women who had roughly 2.7 to 7.1 percent more artificial sweeteners in their diet gained more weight when compared to women considered non-users of artificial sweeteners [17]. A more recent study was conducted by the San Antonio Heart in 2008 which examined 3,682 adults containing both men and women over an eight year period. The results showed that drinkers of the artificially sweetened beverages had higher BMIs with an average BMI gain of 1.01 kg/m² for the control and 1.78 kg/m² for artificially sweetened beverage consumption [10,17]. In summary, adults who consumed artificially sweetened products gained significantly more weight.

Research: Artificial Sweetener Consumption in Children

A study was conducted by Growing up Today which included 11,654 children within the age range of nine to fourteen years to examine the body mass index and weight of adults.
consuming artificially sweetened products. The results showed a positive association between diet soda and weight gain for only boys. The boy participants revealed an increase BMI by 0.16 kg/m² for every daily serving of a diet beverage. However, with the girl participants, no correlation was significant enough to report [5]. Next, using only female participants within the age group of 9 to 19 for duration of ten years showed no correlation between BMI and diet soda was significant for girls while regular soda intake had an elevated BMI [9]. In conclusion, the data sparks an interest that boys show the same positive result of weight gain seen in adults while females have no correlation to weight gain until adulthood.

**Artificial Sweeteners Effect on the Mind** (F1)

As with any scientific inference based on observations, studies are conducted in order to back up or disprove what has been claimed. Purdue researchers Susan Swithers, PhD, and Terry Davidson, PhD, organized and performed studies on rats. In the experiments, two groups of rats were fed sweet-flavored, soda-like drinks. And with one group of rats, the liquid was sweetened with sugar, while the other group’s drinks were sweetened with artificial sweetener saccharin. The point of separating the two groups of rats was that those who consumed the sugar-sweetened liquid had a constant relationship with calories and a sweet taste. However, the group of rats who consumed the artificial sweetener had an inconsistent correlation between calories and a sweet taste. And after ten days the rats were given a sweet, high-calorie pudding. The results were that those rats who consumed the saccharin-sweetened drinks ate more of the pudding. And while this initially seems to contradict the argument that just by consuming diet soda it will lead automatically lead to weight gain, it adds a mental perspective to everything. Those rats who consumed the saccharin-sweetened drinks could not mentally identify the connection between calories and sweetness. This suggests that while consuming artificial sweeteners may play some tricks on the human mind, the sweeteners themselves don’t necessarily lead to an increase in weight. Furthermore, this topic is so controversial and not fully understood that one study can point in one direction, while a similar study points in the opposite direction.

Recently it has come to light that the artificial sweeteners in diet sodas don’t physically cause weight gain, but as mentioned, they can fool the mind about sugars, which in turn can ultimately lead to weight gain. Nutrition researcher David L. Katz, MD, who directs the Yale Prevention Research Center, claims “the research as a whole suggests sugar substitutes and other non-nutritive food substitutes have little impact on weight one way or the other.” Katz believes that for every study that suggests there is some harm, there is one that suggests some benefit. In general, Katz believes that human taste buds are not fully able to differentiate between the sweetness found in sugar and from the sweetness found in artificial sweeteners, like aspartame. His 20 years of real world experience with his patients suggests a clever, yet amazing idea. Katz states, “What I have seen in my patients is that those who drink diet soda are more vulnerable to stealth sugars.” And stealth sugars are those sugars that are added into processed foods that do not exactly have a sweet taste. For instance, foods like pasta sauce, bread, or crackers usually contain high-fructose corn syrup. Based on Katz’s research and data, artificial sweeteners do not cause physical harm, but they can be harmful in the sense that they trick us into eating more and more unhealthy foods. In this aspect diet sodas can be harmful. Moreover, too much of anything is usually no good, and the same can be said about sugars.
**Research: Neurobiology of Cravings**  
(AP)

Food reward is associated with two branches known as sensory and postingestive. The two branches are distinguishable by both functional and psychological components of liking such as being pleasurable or palatability and wanting such as appetite or incentive motivation. The mechanism of action which separated the liking and wanted is through neural substrates involved in the neurotransmitter system [6]. However, evidence has been suggested that the artificial sweeteners activate alternative food reward pathways as compared to the natural sweeteners [12]. For instance, ingestion of glucose containing food resulted in a signal depression in the hypothalamus; however, no response was observed following the ingestion of sucralose [16]. Thus, natural sugar and artificial sweeteners activate the gustatory branch differently because sucrose ingestion has a greater activation of insula, orbitofrontal cortex, and amygdale in the gustatory areas. To support the findings, a study was conducted which showed that the activation of the hedonic component increased appetite which causes animals to look for food in order to satisfy the craving for sweetness [16,18]. However, lack of satisfaction which is caused by the inactivation of the postingestive component to the food reward causes the animals to seek food more frequently. As a result, artificial sweeteners encourage sugar craving dependence due to the reduction in reward which can contribute to the obesity epidemic [18].

**Research: Aspartame and Diabetes**  
(AS)

The chemical sweetener Aspartame may have seemed like a good addition to diet sodas at first, but this view is under fire as of late. For instance, the compound has been linked with some hyperglycemia as well as insulin [8]. If there is a strong correlation between hyperglycemia known as high blood sugar, then the millions of individuals drinking soda are harming themselves every time they open a can. Additional studies by Multi-Ethnic Study of Atherosclerosis are showing a link between the soft drink consumption and a higher risk for the development of metabolic syndrome. The study was conducted over a seven year period by distributing a frequency questionnaire to determine whether consumption of diet soda would increase the risk of metabolic syndrome and type II diabetes. The researchers defined the metabolic syndrome as the ‘of three or more of the following (1) waist >102 cm for men or >88 cm for women, (2) triglycerides > 150 mg/dL (3) HDL cholesterol <40 for men or <50 mg/dL for women (4) blood pressure >130/85 mmHg also known as antihypertensive treatment and (5) fasting glucose >100 mg/dL also known as anti-hyperglycemic treatment [14]. As a result, to test for metabolic syndrome, the waist circumference, DMI, glucose levels, and blood pressure levels were measured from the results of the questionnaire. The results showed that a daily consumption of diet soda led to a 36% greater risk to the development of metabolic syndrome while a 67% risk of developing type II diabetes. Furthermore, diet soda consumption resulted in a higher waist circumference and higher fasting glucose level which are both risk factors associated with the metabolic syndrome and type II [14]. In conclusion, even though the study does not establish a causal relationship between diet soda and the metabolic syndrome as well as type II diabetes, the results demonstrate that the consumption of diet soda leads to a greater risk of developing certain components of both the metabolic syndrome and type II diabetes.
Research: Aspartame and Metabolic Syndrome (AS)

In another study conducted by Lutsey et al., daily intake of diet soda was measured to determine the cause for the development of the metabolic syndrome in the Atherosclerosis Risk in Communities (ARIC) over a nine year duration period. The data came from 9,514 participants who were in the age group range of 45-64 and were adjusted for demographic factors such as smoking and physical activity. A 66 item food frequency questionnaire was distributed which the results indicated that the ‘Western dietary pattern which consisted of meat, fried foods, and diet soda was associated with developing metabolic syndrome. However, the ‘prudent diet pattern’ which consisted of a greater consumption of vegetables, fruit, fish, and poultry resulted in a much smaller risk of developing metabolic syndrome [13]. Furthermore, the consumption of meat to an 18 percent increased risk whiles the consumption of diet soda to a 34 percent greater risk in developing metabolic syndrome. In summary, the results indicate that diet soda may lead to the incidence of metabolic syndrome.

Research: Aspartame and Cardio-Metabolic (AS)

Finally, in the Framingham Heart Study, Dhingra et al. observed the relationship between soft drink consumption and risk of developing cardio-metabolic risk factors as well as the metabolic syndrome in middle- aged adults. The study included 6,039 participated who were medically considered free of metabolic syndrome. The data was obtained by distributing a food frequency questionnaire to monitor dietary intake [7]. Thus, the results showed a 48% increased chance of developing metabolic syndrome among the participants who consumed at least one or more soft drinks per day as compared to the individuals who consumed no soft drinks [7]. Furthermore, the soft drinks included both soda sweetened with sugar and soda sweetened with artificial sweeteners. In summary, half the participants had the potential of developing metabolic syndrome with just one soft drink per day which shows the potential hard of aspartame to interfere with the normal functions of the human body.

Conclusion (AP)

Most research conducted thus far showed no correlation between the metabolites of aspartame in the small intestine and neurological damage and increased health risks. However, recent hypotheses claim that aspartame is positively correlated to weight gain and increased BMI by contributing to increased appetite leading to obesity. Furthermore, to explain the correlation, several studies are looking into the increased appetite caused by cravings as the calorie intake of aspartame consumers is equal to and greater to the intake of calories of non-aspartame consumers. Finally, aspartame has also been linked to metabolic syndrome with individuals having high blood pressure and glucose levels. Thus, research is showing a possibility that increased consumption of diet and regular soda can bring the onset of Type II diabetes early in children and adults.

Materials and Methods (AP & FI & AS)

A simple, yet detailed survey is constructed that will be used to assess the amount of soda a person drinks while taking into account many other important elements. The survey has been
generated which consist of ten questions targeting calorie intake and health problems with aspartame consumers. Additionally, the questions range from multiple choice to short answer. The survey is directed towards adults from ages forty and onward to see if there is a trend due to the longer duration of diet soda consumption. The topics of the question include but are not limited to the following: artificial sweetener usage, diet, physical activity, food cravings, food intake, and weight gain and/or weight loss. Furthermore, the questions involve both carbonated and non-carbonated drinks as well food products that contain NutraSweet as the diet component. The mode of distribution is online through the internet site of “craiglist.” The survey is published in a form in roughly around twenty-five states in order to acquire the most amount of responses from every hemisphere. The purpose of the survey is to shed some light on the difference between drinking diet soda and regular soda to determine the impact on the individual’s health.

When it comes to the health of individuals, there are various factors that can affect the wellbeing and longevity of life. As a result, the confounding variables are reduced by having an unbiased worded survey with a large sample population of women and men. Upon obtaining all of the data from the survey-takers, graphs and tables will be conducted to compare the results in order to determine if there is any statistical difference. By observing and analyzing the data, the goal is to be able to determine whether or not there is any correlation between health and amount of soft drinks per day, while taking into consideration the age and number of years the individual has been drinking. Another goal of the survey is to determine whether or not there is a large difference between diet soda and regular, or whether there is no difference at all. Finally, a comparison between the men and women on the three factors of weight gain, cravings, and health problems will be analyzed to establish if there is correlation between the two genders.

Comparison between College Students and Adults (AP)

An identical survey was conducted two years ago that was specific for college students in the age range of 18-24 years ago. The results from the data proved to be contain no significance possibly because of the short duration of soda consumption. However, by targeting a larger range of population, significant statistical data can be generated to test the hypothesis. As a result, based on the previous data from college students and current data from the adult population collected, an analysis will be conducted to see if there is a correlation between weight gain and aspartame. Furthermore, the survey contains several essay columns to allow the person taking the survey room to bring certain opinions into light that a simple one answer response could not answer. In summary, by conducting a survey with a wider range of the population targeting adults as compared to the college students, we seek to determine if there is a correlation between aspartame and weight gain as well as obesity. We also seek to address the effect of aspartame on appetite as several claims address the possibility that aspartame increases cravings which indirectly causes a higher consumption of calories leading to the opposite intention of diet soda on weight control.
PART II (AP)

In today’s world, there seems to be a never-ending list of products such as food and beverages which people enjoy but are harmful at a large enough dosage. In addition, the general rule of ‘too much of a good thing is bad’ holds true once again. The soda industry is booming worldwide, fueled by consumers who often cannot stop at just one can of soda per day. However, there is a negative side to carbonated beverages. For example, regular soda contains ingredients such as caffeine, carbonated water, along with tons of sugar. Additionally, with the obesity epidemic on the rise in the United States, numerous people are turning to ‘diet’ food and beverages, particularly products which contain artificial sweeteners, in an attempt to manage and lose weight. Thus, diet soda consists of carbonated water, caramel color, aspartame, phosphoric acid, potassium citrate, natural flavors, citric acid, and caffeine. With a complex ingredient list such as this, it comes as no surprise that many people do not actually know what they are consuming. Consequently, people are drawn in by the enticing messages of manufacturing companies and advertising agencies who lead consumers into believing that artificially sweetened food and beverages can aid in weight loss. However, many research studies have proven otherwise with data linking aspartame to long-term weight gain and increased insulin resistance. Even though the studies do not establish causality, researchers are questioning the link between artificial sweeteners and weight loss. As a result, we have designed a survey to obtain and analyze data to determine whether artificial sweeteners can contribute to weight gain that further fuels the obesity epidemic. An analysis will be conducted between college students within age range of 18-27 and adults 40+ who either drink or eat diet/ regular products. The purpose of the investigation is to determine if there is a trend between soda intake and the increased food consumption caused by cravings from diet soda. Finally, the health status of the individual as well as the daily routine habits of food intake and physical activity will be examined to determine if there is a decline over longer consumption of diet soda.

Results Analysis (AP)
In the first part of the study involving college students, 55 participants answered the survey while the study involving the adults contained 42 participant responses. In both groups consisted of both males and females with diverse ethnicities consisting of White, African American, Asian, Asian, Indian, and Hispanic. The average height, weight, and ideal weight of the college students were 65.46 inches, 145.24 lbs, and 140.05 lbs, respectively. However, for the adults, the average height, weight, and ideal weight were 69.43 inches, 163 lbs, and 140.27lbs. The results show that the adults were overall a greater height while having a larger weight than college students; however, the ideal weight was nearly the same for both groups. Further, the average waist circumference of the college student respondents was 30.24 inches and the average hip circumference was 34.02 inches while adult respondents were 29.81 inches and 38.39 inches, respectively.
Figure 1: The figure on the left depicts the amount of 12 oz servings of artificially sweetened (diet) soda/carbonated beverages drank, and the figure to the right regular shows the amount of 12 oz servings of (not sugar free) soda/carbonated beverages drank.

Figure 2: The figure on the left depicts the amount of 12 oz servings of artificially sweetened non-carbonated beverages drank, and the figure to the right regular shows the amount of 12 oz servings of regular sweetened non-carbonated beverages drank.

Figure 1 suggests that well over 75% of the respondents have consumed a minimum of 0-1 12 oz servings of artificially sweetened carbonated diet (soda) between now, 5-10, and 15-25 years ago. Also, the amount of 12 oz (not sugar free) soda/carbonated beverage consumption has been maintained to a minimum of 0-1 servings with 91%, 65% and 81% of the respondents drinking only between 0-1 servings now, 5-10, and 15-25 years ago respectively. In addition, figure 2 delineates a similar trend to that of figure 1 with 12 oz non-carbonated beverages. Roughly 72.7% of the respondents have consumed between 0-1 12 oz servings of artificially sweetened non-carbonated diet (soda) between now, 5-10, and 15-25 years ago respectively, and 72.7%, 65.45%, and 74.5% of the respondents have consumed between 0-1 12 oz servings of regular sweetened non-carbonated beverages between now, 5-10, and 15-25 years ago respectively. When comparing the trends between the consumption of 12 oz artificially sweetened carbonated/non-carbonated beverages, and the consumption of 12 oz regular sweetened carbonated/non-carbonated beverages, both are skewed to the right. A similar percentage of respondents have drank between 0-1 12 oz servings of artificially sweetened carbonated/non-carbonated and regular sweetened carbonated/non-carbonated beverages between now, 5-10, and 15-25 years ago. Thus, it’s not clear from this data that artificial sweetened carbonated/non-carbonated beverages are preferred over regular sweetened carbonated/non-carbonated
beverages, and is arduous to conclude weight gain/loss a result of one or the other. However, it’s satisfying to see both being taken in very moderate amounts.

![Bar chart](image1.png)

**Figure 2:** shows the number of responses located on the y-axis and the number of twelve ounce servings/day on the x-axis of both artificially sweetened soda/carboanted on the left and regular sweetened sugar carbonated beverages on the right. The analysis is conducted of adults at the duration of currently, 5-10 years, and 15-25 years.

![Bar chart](image2.png)

**Figure 3:** shows the number of 12 oz servings/day of adults during the duration of now, 5-10 years ago, and 15-25 years ago of both artificially sweetened non-carbonated beverages and regular sweetened non-carbonated beverages.

Figure 2 demonstrates how the greatest number of artificially sweetened carbonated soda beverages is consumed now, while the second greatest number is 15-25 years ago and finally the least number of diet sodas were consumed about 5-10 years ago. Furthermore, figure 2 suggests that about 65% of the respondents have consumed a minimum of 0-1 12 oz servings of artificially sweetened carbonated diet soda between now, 5-10, and 15-25 years ago. Also, the amount of 12 oz. artificially sweetened soda/carbonated beverage consumption was 66%, 53% and 75% of the respondents drinking only between 0-1 servings now, 5-10, and 15-25 years ago.
respectively. However, after one 12 oz. servings/day of diet soda, the number of responses halves from 20 to 10 but is roughly maintained in all the decades studied. Thus, about half of the participants drink more than two 12 oz. servings/day of diet soda with the amount remaining steadily in all the years. There is a different trend regarding regular sweetened carbonated beverages which are mostly consumed 5-10 years ago, followed by now, and lastly at 15-25 years ago. The data shows a change in the number of cans consumed per day for regular sweetened carbonated beverages. Thus, the greater the number of 12 oz. servings ingested per day seems to be lowest at the current duration period. The results indicate that in the past consumers were drinking sodas very frequently which gradually declined as the individual got older. As a result, individuals drank more regular sweetened carbonated soda during the 5-10 years rather than the current and 10-25 years ago being 30.24%. Through the observation of Figure 3, the results show adults are consuming the most artificially sweetened non-carbonated beverages now rather than 5-10 years ago with the 15-25 years ago being the least consumption period. The data shows that the beverages intended for weight loss are becoming more popular at the current time period and decrease through the increasing decades. However, with regularly sweetened non-carbonated beverages, the consumption was mostly consumed in the past 5-10 years. Thus, regularly sweetened non-carbonated beverages seemed to be more popular in the past (5-10 years ago) than currently. Lastly, regular sweetened non-carbonated beverages had the most consistency in consumption throughout the years and the amount of 12 oz. servings/day. Furthermore, the quantity of consumption is greatest for the consumption of regular sweetened non-carbonated beverages. Another difference is between carbonated and non-carbonated artificially sweetened beverages. For instance, the non-carbonated artificially sweetened beverages were mostly consumed in the past 5-10 year; however, regularly sweetened non-carbonated beverages are more popular to young adults now than ever before. Thus, artificially sweetened beverages were at a peak a decade ago but slowly declined in the present while the regularly sweetened non-carbonated beverages are more popular among the older population currently.

![Excess Calories](image1)

![Excess Calories](image2)

**Figure 4:** The scatter plot on the left shows the delineate the amount of excess calories consumed by respondents on a daily basis by adults while the scatter plot on right is represent of the college students.

Figure 4 suggests that adults, on average, consume a greater number of excess calories per day than college students do. Also, adults seem to consume a much higher quantity of calories than college students. For instance, there are plenty more responses of an excess of
1,000+ calories with adults than there are for college students. Moreover, an estimated 80% of the college student respondents eat an excess between 0-500 calories with 23.63% of the respondents consuming 0 calories in excess everyday presently. With the exception of the outliers, and with evidence of satisfactorial physical activity, mediated artificially sweetened/regular sweetened carbonated and non-carbonated beverage consumption, and limited excessive calorie intake, one can confidently predict a small deviation in weight.

In summary, adults consume the most quantity of diet soda now and the most regular soda in the past while college students currently consume much less diet soda. Adults consume more artificially sweetened and regularly sweetened non-carbonated beverages in the past than now. The data also shows that college students are now consuming more regularly sweetened non-carbonated beverages than artificially sweetened non-carbonated beverages.

**Letter to the Editor** (FI)

People today tend to enjoy the power they have over making their own decisions. Some of these decisions are insignificant ones like going to a vending machine during lunch to enjoy a can of soda, while some are more meaningful ones like choosing which college to attend. Either way, people enjoy the option of independent decision making by choosing what to do, as well as having the pleasure to make those decisions. Therefore, to take some everyday options and choices away from people would ethically be wrong, although it might be better for them later in life. As a result, this is where removing soda and vending machines from common places gets controversial.

Soda, both diet and regular, has found its way into our schools and workplaces. Aside from being at home, school, and work are the places where citizens spend the most time. Additionally, if harmful products, such as soda, reside in these types of places, then most people will consume more of it. It’s not just adults that are consuming more and more soda. Children and teens also enjoy this carbonated drink. Therefore, having soda readily available in schools and the workplace can only lead to more and more negative effects.

The presence of soda, or any other product or substance in a place does not necessarily mean that it will be abused; however, the odds of that product to be used or consumed are greater. As a result, if there is some new kind of rule or law that removes soda from schools and offices, it would be over-stepping peoples’ boundaries, regardless of the benefits. For instance, people may be fully aware of soda’s negative aspects, but they may enjoy it so much they consume it anyway. Eliminating the soda would most definitely anger those people, even though they may be forced to consume less sugar.

Perhaps the best method of dealing with the issue, without over-stepping any boundaries, would be education. There is no doubt some adults are aware of the harmful substances in soda and drink it anyway. But in the case of children and teens, the consumption of soda may be limited if they actually knew what went into that can they loved so much. Educating the youth can also be a very powerful tool. Educating kids not only gives them proper life habits, but it also plants a seed at home that may grow and thrive if the conditions are right. For instance, once kids and teens are knowledgeable and perceptive with regards to what they are consuming they can not only help themselves, but perhaps bring these positive habits unto their family as well.
The key to a good education relies heavily on the interest of the students. If children’s and students are willing to learn, they will but if they are against the teacher, subject or school in general they will not. Therefore, it is imperative that any education regarding the negative effects of diet and regular soda be made fun and interesting to children. Once interested, hopefully these kids will grasp a better understanding about proper consumption habits. A potentially beneficial method of teaching kids may be to introduce some sort of program into schools. And of course these programs would have to require some sort of fun in them. Students will be encouraged to attend these programs because it will take them away from the monotony of their daily schedule, if only for a short time. As soon as kids are encouraged to complete these educational programs, they will not even realize it is a learning process that will help them. In general, these types of educational programs are meant to instill good consumer habits in the youth.

The focus of these programs will not be to change a child’s personality or eating habits but to focus on opening these young eyes to the tricks and deception of large companies. Incorporating potentially harmful substances, such as aspartame, should not go unnoticed. It is not the child’s fault that they start drinking soda every day, which is why stopping a bad habit from the start can lead to potentially great results.

**Letter to the Editor** (AP)

Dear adult consumers of soda,

My partner and I are conducting research at Rutgers University to determine the effects of long term consumption of artificial sweeteners and regular sweeteners contained in many beverages and drinks. The survey is specifically drawn to the amount of soda consumption as well as focused on the calorie and food consumption. We seek to address the effect of aspartame on appetite as several claims address the possibility that aspartame increase cravings which indirectly cause a higher consumption of calories. Thus, if you experienced a daily loss of control over food intake and have taken alternative means such as diet soda consumption to curve and maintain your weight gain, please answer the survey. They survey is a total of 10 questions that ranges from numerical rating scales to fill-in single box comments. Thank you for your time. Your answers can allow us to draw some correlation with soda consumption and health.

The link is as follows: [http://www.surveymonkey.com/s/TPMDN3P](http://www.surveymonkey.com/s/TPMDN3P)

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References