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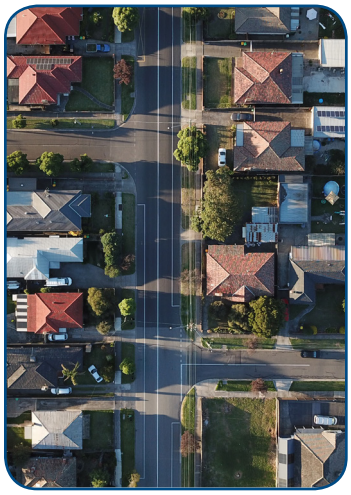
University of California, Davis, Department of Nutrition and the Center for Nutrition in Schools

Can Neighborhood Layout Affect Childhood Obesity?

Childhood obesity has increased 300 percent in the last 20 years while physical activity has decreased (1). One way the environment is thought to impact obesity rates is through neighborhood walkability, which is the ease in which one can safely and easily walk through a neighborhood. One study from 2019 examined the associations between neighborhood walkability and childhood obesity, and the potential variation between children living in urban, urban-rural mixed, and rural areas (1).

In this study, which was conducted in a single school district located in the Southeast, researchers included over 13,000 students from grades 3-5, gathering data about body mass index (BMI) and the walkability score of the child's neighborhood, as determined by entering the child's home address into WalkScore.com. This score accounts for amenities, such as banks, grocery stores, or parks within walking distance, as well as how dense intersections are and block length, among other factors.



The overall results of this study show that children who live in a neighborhood with a high walkability score tend to have a lower BMI than children living in areas of low walkability. However, there were variations between the rural and urban areas. As the walk score increased in rural areas, BMI tended to decrease, but as the walk score increased by the same

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Letter from the Editors

Welcome to a special UC Davis student edition of Nutrition Perspectives. Each year, Dr. Scherr teaches Nutrition 129: Journalistic Practicum in Nutrition. In this class nutrition undergraduates are educated about communicating nutrition information to the public through practical and hands-on experience in science writing for a non-scientific audience. In this special issue, we are pleased to share a selection of articles written by nutrition students on a variety of recent nutrition topics.

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amount in urban areas the study found a slight increase in BMI. This is believed to be caused by other factors associated with living in an urban environment, such as greater access to fast food restaurants, having a lower socioeconomic status, and higher crime rates. There was no relationship between walkability score and BMI determined among youth living in suburban neighborhoods. The researchers found children who live in suburban neighborhoods tended to have more opportunities to play outside but were completely dependent on cars for transportation, and therefore spent more time sedentary.

These results suggest that living in a more walkable neighborhood can encourage physical activity and decrease the rate of childhood obesity. However, these findings varied by location and a limitation to this study is that walkability scores may be potentially skewed due to the different amenities that were available but not relevant to children. Most children do not shop at stores or eat at restaurants alone, so having these amenities close by wouldn't have a major effect on walkability. Another limitation is the data were only taken from a single school district resulting in limited geographic variability and generalizability. Information on nutrition and physical activity was unavailable, which could have explained further a connection between obesity and environmental factors. However, a large sample size and individual-level data led to a comprehensive examination of the relationship between walkability and youth obesity.

References

1. Stowe EW, Hughey SM, Hallum SH, Kaczynski AT. Associations between walkability and youth obesity: differences by urbanicity. Child Obes. 2019 Dec 1;15(8):555-9.

By Kirissa Padilla, Alice Chen, Geana Haddad, and Andres Lara. Nutrition 129, Department of Nutrition, University of California, Davis.

Modifiable Risk Factors for Developing Dementia

Dementia refers to various symptoms of cognitive decline, such as impaired communication, memory, and thinking. In most countries, dementia affects 5 to 7 percent of people aged 60 and older. Due to the rise in lifestyle diseases, such as obesity, hypertension (high blood pressure), and diabetes, more people are at higher risk for developing dementia. In addition, alcohol use also increases risk of dementia. In fact, lifestyle diseases and alcohol use comprise one-third of the total risk for developing Alzheimer's disease (AD) (1,2).

Obesity, high blood pressure, diabetes, and alcohol consumption all raise the risk of developing dementia.

Research shows that the brain's structure is sensitive to factors contributing to dementia. While the brain naturally atrophies (loses neurons and connections between them) very slowly after the age of 40 years, atrophy is the most prominent

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Certain regions of the brain are more likely to atrophy with Alzheimer's disease.

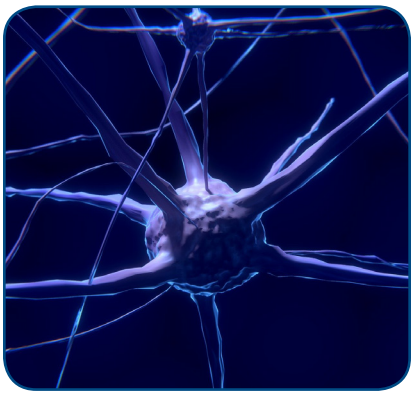
brain structural abnormality in AD. However, brain atrophy rates vary between individuals due to genetic differences and environmental or lifestyle factors.

Researchers at the University of Southern California tested to see if the volume of gray matter in specific regions of the brain are associated with aging and modifiable risk factors (MRF) such as hypertension, obesity, diabetes, and alcohol use, using MRI and lifestyle questionnaire data from UK Biobank (UKB) (n=8,312) (3). The study also investigated whether the gray matter volume differences are also associated with AD, using data from the Alzheimer's Disease Neuroimaging Initiative (n=233, including 100 patients with AD, and 133 without AD).

Aging and the four MRFs studied were associated with lower volume of gray matter in specific regions of the brain. The parts of the brain with lower gray matter volume were consistent with those from the participants with AD. Since the link between aging and MRF with gray matter volume had a greater effect together, the researchers concluded that having more risk factors raises the severity of the gray matter loss. The researchers also detected differences in cognitive performance associated with age and the four MRFs studied, even among those who were cognitively healthy.

The study had a few limitations. Cross-sectional analysis was used in the study, and it cannot show causation. The UKB population is also overall healthier than the general UK, making it difficult to draw inferences about how these findings translate to the general UK population.

Overall, this study demonstrates that atrophy in certain regions of the brain is associated with AD, aging, and MRFs. The researchers suggest that, if further research can identify the mechanisms underlying these changes in brain volume, there is the potential to develop treatments to slow or reverse AD progression in the early stages.



Determining the underlying mechanism behind these brain changes may help develop future therapies.

References

1. Norton S, Matthews FE, Barnes DE, Yaffe K, Brayne C. Potential for primary prevention of Alzheimer's disease: an analysis of population-based data. Lancet Neurol. 2014; 13(8): 788-794. doi:10.1016/S1474-4422(14)70136-X
2. Livingston G, Sommerlad A, Orgeta V, et al. Dementia prevention, intervention, and care. Lancet.2017;390 (10113):2673-2734. doi:10.1016/S0140-6736(17)31363-6
3. Suzuki H, Venkataraman AV, Bai W, Guitton F, Guo Y, Dehghan A, Matthews PM. Associations of Regional Brain Structural Differences With Aging, Modifiable Risk Factors for Dementia, and Cognitive Performance. JAMA Network Open. 2019;2.

By Saba Almassi, Eli Cruz Rodriguez, Xianyu (Adam) Zhu. Nutrition 129, Department of Nutrition, University of California, Davis.

Hydration Status and Cognitive Functioning

Researchers hypothesize that even moderate or mild dehydration status has the potential to negatively influence cognitive performance. Specifically, hydration status is understood to inhibit proper functioning of multiple mental faculties, such as reaction time, verbal capacity, attention, and mental processing. Older adults are at greater risk of mild and moderate dehydration due to various physiological changes that occur as the body ages, including decreased thirst response, decreased muscle mass, and the use of diuretic medications. With this at-risk community in mind, researchers used data from the National Health and Nutrition Examination Survey (NHANES) to examine a group of older adults and understand the relationship between hydration status and cognitive performance (1).

Older adults are at greater risk of mild and moderate dehydration due to various physiological changes that occur as the body ages, including decreased thirst response, decreased muscle mass, and the use of diuretic medications.

Researchers reviewed the NHANES data collected from 2011-2012 and 2013-2014 on a nationally representative sample of 2,506 community dwelling, older adults (>60 years old). In order to measure the hydration status of the subjects, researchers utilized calculated serum osmolality (Sosm), a reliable proxy for hydration status. This biomarker is useful for assessing hydration as it measures the amount of dissolved substances in the blood, such as glucose and sodium, which are more concentrated when someone is dehydrated (2). The Sosm was compared with measured water intake through a 24-hour recall performed by a trained interviewer. Water intakes were classified as either being above or below the adequate intake (AI) recommendations of >2 L/day for women and >2.5 L/day for men. After measuring hydration status, cognitive performance was then measured with three different examinations that tested: verbal learning and memory; verbal fluency; and processing speed and attention.

Dehydration can inhibit proper functioning of multiple mental faculties, such as reaction time, verbal capacity, attention, and mental processing.

Statistical analyses yielded mixed results. Among women, multivariate analyses provided no evidence for an association between Sosm and scores on two of the cognitive tests, however women with higher Sosm (lower hydration status), had decreased processing speed and attention compared to women with better

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hydration status. With respect to men, there were no associations between hydration status and cognitive function after controlling for a variety of sociodemographic and health factors. These results, while inconclusive, were in agreement with many previous studies that induced dehydration in other ways (such as through exercise and heat).

Despite lack of a strong relationship between cognitive performance and hydration status, researchers suggested there may be findings of interest. Associations between cognitive function and hydration were not as strong when factors such as increasing age, lower education levels, higher incidence of diabetes, lower levels of physical activity, and more than 9 hours of sleep per day were taken into account. It is important to consider the limitations of this study. While Sosm has been argued to be a better biomarker for hydration status than urinary biomarkers in older adults with reduced urinary capacity, it has been shown to be similar between high and low water drinkers. Also, for this study, Sosm was calculated rather than being measured directly. Another limitation could be the that the cognitive tasks selected for this study were those that could be administered easily and may not be sensitive to hydration status. Finally, these data were collected cross-sectionally so directionality of the observed associations cannot be determined.

Water intake is vastly important for body processes such as digestion, absorption, circulation, transport of nutrients, and maintenance of body temperature, among many others.

Although this study was largely inconclusive, the importance of hydration in everyday life should not be understated. Water intake is vastly important for body processes such as digestion, absorption, circulation, transport of nutrients, and maintenance of body temperature, among many others (3). Research on hydration status as it relates to cognitive functioning is an emerging field and warrants more attention because the potential is important and much more needs to be understood.

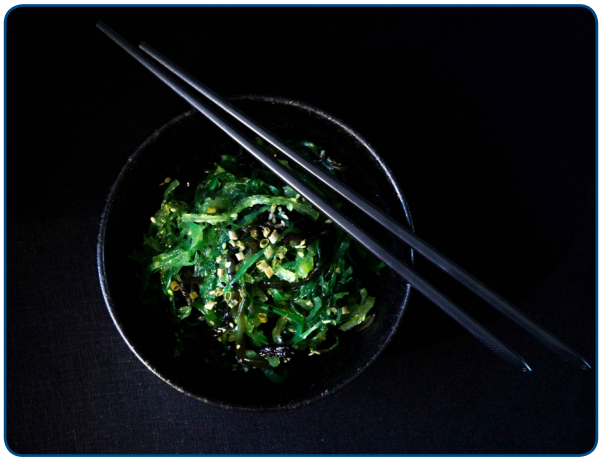
References:

1. Bethancourt HJ, Kenney WL, Almeida DM, Rosinger AY. Cognitive performance in relation to hydration status and water intake among older adults, NHANES 2011-2014. Eur J Nutr. 2019;10.1007/s00394-019-02152-9. doi:10.1007/s00394-019-02152-9
2. Rasouli M. Basic concepts and practical equations on osmolality: Biochemical approach. Clin Biochem. 2016 Aug;49(12):936-41. doi: 10.1016/j.clinbiochem.2016.06.001. Epub 2016 Jun 22.
3. Robinson B, Berggren T, Jones AM, and Scherr RE. Nutrition & Health Info Sheets for Health Professionals – Water. UC Davis Department of Nutrition. 2018. https://nutrition.ucdavis.edu/outreach/nutr-health-info-sheets/pro-water

By Savannah Boyd, Alyssa Allen, Allison Boyer, and McKenzie Richard. Nutrition 129, Department of Nutrition, University of California, Davis.

Seaweed May Help Prevent Heart Disease

Researchers in Japan sought to determine if seaweed consumption is associated with a decreased risk for ischemic heart disease and stroke, types of cardiovascular disease that the World Health Organization states are among the leading causes of death globally (1). Seaweed is very nutrient dense, containing many beneficial vitamins, minerals, omega-3 fatty acids, antioxidants, and fiber, while containing very few calories. All of these nutrients, especially fiber and omega-3 fatty acids, have consistently demonstrated protective effects against heart disease. Although consumption of seaweed is low in many Western countries, people in many nations in Asia consume it daily, including Japan.



Seaweed is very nutrient dense, containing many beneficial vitamins, minerals, omega-3 fatty acids, antioxidants, and fiber

For this study, researchers enrolled two cohorts from the Japan Public Health Center study starting in 1990 (Cohort 1) and 1993 (Cohort 2) consisting of 86,113 people total, aged 40 to 69 years. To assess participant characteristics and dietary intake, participants completed a questionnaire at the start of the study that gathered information on demographics, medical history, physical activity, smoking, and alcohol consumption. To assess seaweed consumption and other dietary habits, a food frequency questionnaire (FFQ) was completed. In order to determine heart disease and stroke outcomes, researchers tracked the participants until 2009 (Cohort 1) and 2012 (Cohort 2) and participant medical records were reviewed to determine the number of instances of ischemic heart disease and total stroke. Mortality due to these events was confirmed by death certificates.

Throughout the study, 4777 strokes and 1204 instances of ischemic heart disease were detected. There was no significant association between seaweed intake and risk of stroke in women and men. Data for ischemic heart disease and total cardiovascular disease indicated that those who consumed almost no seaweed were at much higher risk compared to those that ate seaweed daily. For men and women combined, the risk of ischemic heart disease was inversely related with seaweed intake. This was the case even when the researchers adjusted their analyses for potentially related factors, such as history of diabetes or high cholesterol, body mass index, overall dietary intake, smoking status, and alcohol consumption.

The researchers proposed that lipid-lowering and blood-pressure lowering components present in different seaweed products may be the mechanism behind these findings . A study conducted on mice found that fucoidan, a substance in seaweed, regulated the metabolism of serum fats by increasing the activity of an enzyme that reduces the concentration of triglycerides and LDL cholesterol in the blood (2). Other studies found similar results on the effects of soluble fiber in seaweed and a decrease in blood pressure (3,4). Additionally, in the current study, an increased intake of seaweed was found to be associated with an overall

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healthier dietary pattern. While there were many strengths to the study including a large sample-size and a high follow-up rate, it also had some limitations. Food frequency questionnaires are prone to self-reported measurement errors and researchers were unable to adjust the analyses for socioeconomic status, which may be a potential confounder. Overall, this study implies that there is potential to decrease risk of developing cardiovascular disease, specifically ischemic heart disease, through an increase in seaweed consumption.

References:

1. Murai U, Yamagishi K, Sata M, et al. Seaweed intake and risk of cardiovascular disease: the Japan Public Health Center-based Prospective (JPHC) Study. Am J Clin Nutr. 2019 Dec 1;110(6):1449-1455. doi: 10.1093/ajcn/nqz231.
2. Yokota T, Nomura K, Nagashima M, Kamimura N. Fucoidan alleviates high-fat diet-induced dyslipidemia and atherosclerosis in ApoEshl mice deficient in apolipoprotein E expression. J Nutr Biochem 2016;32: 46–54.
3. Krotkiewski M, Aurell M, Holm G, Grimby G, Szczepanik J. Effects of a sodium–potassium ion-exchanging seaweed preparation in mild hypertension. Am J Hypertens 1991;4:483–8.
4. Yamori Y, Nara Y, Tsubouchi T, Sogawa Y, Ikeda K, Horie R. Dietary prevention of stroke and its mechanisms in stroke-prone spontaneously hypertensive rats: preventive effect of dietary fibre and palmitoleic acid. J Hypertens Suppl 1986;4:S449–52.

By Clara Matsumoto, Tepanka R. Van Ryn, Rini Jablonski, Brittany Kohler. Nutrition 129, Department of Nutrition, University of California, Davis.

Sustainable Diets May Decrease Risk For Weight Gain, Overweight and Obesity

While dietary recommendations aim to improve the nutritional status of the population and decrease risk of disease, it is important to consider their social, cultural, economic, and environmental impacts of the dietary patterns that are being promoted. In Western countries especially, highly industrial, unsustainable food systems, may be related to the increasing prevalence of obesity (1). The Food and Agriculture Organization defines sustainable diets as "diets with low environmental impacts that contribute to food and nutrition security and to healthy life for present and future generations" (1).

Researchers in France created the Sustainable Diet Index (SDI) in order to evaluate the sustainability of French dietary patterns, based on environmental,

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nutritional, economic, and sociocultural factors(2). Using data from the NutriNet-Santé, researchers examined the relationship between sustainable diets, as measured by the SDI, and risk of obesity (3).

Participants (n=15,626) completed several questionnaire to estimate organic and conventional food consumption, food practices as well as to collect information on sociodemographic and lifestyle characteristics. Each year of follow-up, participants were asked to report their weight and height in order to calculate their body mass index (BMI) in order to estimate overweight and obesity.

Those with the least sustainable diets ate more meat, dairy, sweets, and soda.

Participants with diets that scored higher on the SDI (meaning more sustainable) were less likely to be overweight or obese. Those with the least-sustainable diets were more likely to consume more calories compared to more-sustainable diets, and were more likely to gain weight over the course of the three-year study. This was the case even after the researchers took other factors into account that may be related, such as education, smoking status, income, and physical activity level. Low-sustainability diets were also more likely to contain more meat, dairy, high-sugar and high-fat foods, and soda. Diets that were more sustainable were more likely to include whole grains, fruits, vegetables, soy, legumes, and nuts.

Overall, this study suggests that sustainable diets may lower the risk of obesity and overweight. However, this study did include some limitations that should be considered. First, participants were asked to self-report their weight and height which has the potential to introduce error and bias into the results. Second, participants involved in an on-going study on nutrition and health were asked to volunteer for this study with optional questionnaires. Compared to the entire group of NutriNet-Santé study participants, volunteers for this study had differences in baseline BMI, smoking status, income, and education, all of which have associations with weight change. This introduces some selection bias because participants may have been more likely to volunteer for this study if they already had some interest in nutrition and health. Another limitation to this study is that weight gain often occurs gradually over a long period of time, and the follow-up time period in this study is relatively short. It would be beneficial to investigate the long-term effects of a sustainable diet on weight gain. Researchers also point out that this is the first study to assess the relationship between sustainable diets and weight gain using a validated sustainable dietary index. Researchers suggest that this index may be improved by including more indicators for sustainability. The findings of this study suggest that highly sustainable dietary patterns are associated with reduced risk in weight gain, overweight, and obesity compared to less-sustainable dietary practices. Additional research is necessary to further explore the association between sustainable dietary patterns and health outcomes.

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References

1. FAO. Sustainable diets and biodiversity: directions and solutions for policy, research and action[Internet]. Rome, Italy: FAO, Nutrition and Consumer Protection Division; 2012. [cited 2019 Jul 3] Available from: http://www.fao.org/docrep/016/i3004e/i3004e.pdf.
2. Seconda L, Baudry J, Pointereau P, Lacour C, Langevin B, Hercberg S, Allès B, Kesse-Guyot E. Development and validation of an individual sustainable diet index in the NutriNet-Santé study cohort. Br J Nutr 2019;121(10):1166–77.
3. Seconda L, Egnell M, Julia C, et al. Association between sustainable dietary patterns and body weight, overweight, and obesity risk in the NutriNet-Santé prospective cohort [published online ahead of print, 2019 Nov 14]. Am J Clin Nutr. 2019;nqz259. doi:10.1093/ajcn/nqz259

By Alison Kou, Wei Perseus Junxi, and Nora Mooney. Nutrition 129, Department of Nutrition, University of California, Davis

Impact of Energy Drink Ingredients on Cardiovascular Markers

Energy drinks are unique in comparison to other drinks because of combinations of diverse ingredients that are not often found in other beverages, such as high amounts of caffeine, and additives such as taurine, inositol, and glucuronolactone. Reports of negative side effects, often impacting the cardiovascular system, have ranged from mild to severe, though it is unclear if these can be attributed to a single ingredient or a combination. In a recent study published in the *Journal of Nutrition,* researchers examined how different ingredients, as well as combinations of certain ingredients, impacted markers of cardiovascular health in a group of healthy adults between the ages of 18 and 25 (1).

Energy drinks have been linked to variety of side effects, ranging from mild to severe.

Participants were randomly assigned to one of two groups, either 1,000 ml (n=19) or 740 ml (n=19) of the study beverages, in a randomized cross-over trial. Specifically, this means that the participants would consume each of four different drinks with a "washout" period of at least four days between drinks so that all ingredients would clear participants' systems before consuming the next drink. The order the drinks were to be consumed was randomly assigned and double-blinded. The four drinks included: a commercially-available energy drink; a control drink without any of the energy drink ingredients of interest; control drink with caffeine; and control drink with taurine. The majority (n=15) of those assigned to the 1,000 ml group also continued in the study with two more drinks: control drink with caffeine and taurine and control drink with glucuronolactone.

After consuming each of the drinks, researchers assessed how participants responded by taking blood measurements of caffeine levels, insulin response, and glucose levels, as well as blood pressure and heart rate. They also calculated mean arterial pressure (MAP), which provides an overall picture of blood pressure (2). Blood

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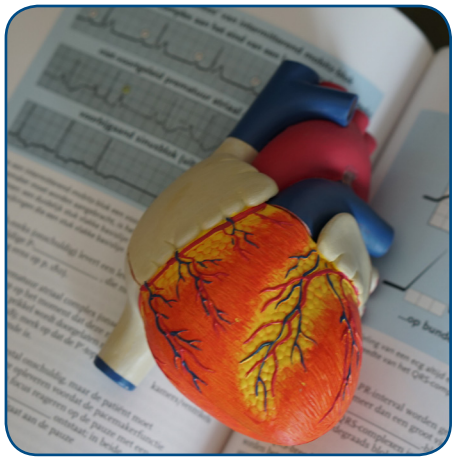

More than half of the participants had one or more symptoms,such as sweating, nausea, headache, and palpitations, among others.

samples were taken at before consuming the drink and again after one hour, while blood pressure and heart rate were measured at these time points, as well as after 3, 7, and 11 hours. In addition, participants recorded any symptoms they experienced at all time points.

Blood levels of caffeine increased in both the 1,000 ml and 750 ml groups after consumption of a caffeinated drink, compared to baseline and the control drink. More than half of the participants had one or more symptoms (such as sweating, nausea, headache, and palpitations, among others) on a scale from mild to severe. With the consumption of caffeine, participants experienced two or more symptoms, especially in the group that consumed 1,000 ml. Out of 38 participants, five developed severe symptoms with the consumption of caffeine, including nausea, tremor and severe restlessness. With drinks containing caffeine, blood pressure and heart rate changes were detected after one hour, but returned to normal after a few hours. With all products tested, across the board there was a decrease in glucose and an increase in insulin concentration after one hour compared to baseline.

This study has limitations that impact the ability to generalize the findings to other situations. While the average consumption among those who consume energy drinks in Germany (where the study took place) is 1,000 ml per day, study participants consumed this amount within an hour. The results may not be applicable to cases when the drinks are consumed over the course of a day. Overall, the negative effects of energy drinks and their ingredients were small for the population of young, healthy adults being studied. These symptoms may be more severe in those with cardiovascular disorders and heart arrhythmias. More research in diverse populations is needed to further elaborate on negative changes in blood pressure, heart rate, and glucose metabolism caused by ingredients found in energy drinks.

Those with cardiovascular disorders and heart arrhythmias may be at higher risk for severe symptoms.

References:

1. Basrai M, Schweinlin A, Menzel J, et al. Energy Drinks Induce Acute Cardiovascular and Metabolic Changes Pointing to Potential Risks for Young Adults: A Randomized Controlled Trial. J Nutr. 2019;149(3):441450. doi:10.1093/jn/nxy303
2. DeMers D, Wachs D. Physiology, Mean Arterial Pressure. [Updated 2020 Apr 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538226/

By Jessica Fung, Amber Morris, Alexandra Gori, and Guadalupe Ambriz. Nutrition 129, Department of Nutrition, University of California Davis.

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UCDAVIS

University of California, Davis

Nutrition Perspectives
Nutrition Department
One Shields Ave.
Davis, CA 95616

Phone:
530.752.3387

Nutrition Perspectives
University of California, Davis
Nutrition Department
One Shields Ave
Davis, CA 95616