

Increase Fruit, Vegetables and Decrease Added Sugar

Oregon Health Sciences University

Physician Assistant Program

**Two and a Half Apples a Day Keeps the PA Away: Increasing Fruit and Vegetable Consumption While Decreasing Added Sugar in Adolescents**

Kip Beckwith, PA-S

Community Outreach Project

November 26, 2023

## **Introduction**

Americans are eating too little fruits and vegetables and too much added processed sugar.<sup>1-3</sup> In a recent CDC report, only 7.1% of American youth eat the recommended amount of fruit per day and only 2.0% of American youth eat the recommended amount of vegetables per day.<sup>1,2</sup>

American adolescents have the largest gap between the recommended amount of nutritious food and actual consumption as compared to any other American age group.<sup>4</sup> This places adolescents at particular risk for dietary associated deficiencies and health conditions.<sup>4</sup> Meanwhile, three out of five Americans eat more than the daily recommended amount of processed added sugar in any given day.<sup>3</sup> There are multiple health problems associated with this trend. Excess added sugar intake is associated with weight gain, obesity, cardiovascular disease, type two diabetes mellitus, tooth decay, hypertension, and increased overall mortality.<sup>3,5,6</sup> The lack of fruits and vegetables in diets is not just an American issue. The World Health Organization estimates that in 2017, 3.9 million deaths worldwide were attributed to inadequate fruit and vegetable intake.<sup>7</sup> According to the CDC, cardiovascular disease is the number one cause of mortality in America resulting in 1 in 3 of all deaths or more than 859,000 deaths per year.<sup>8</sup> Meanwhile, fruits and vegetables offer essential macro and micro nutrients such as fiber, vitamins, minerals and antioxidants.<sup>9,10</sup> Eating fruits and vegetables is associated with decreased overall mortality.<sup>5</sup> Healthy People 2030 has identified three specific targets – “Increase vegetable consumption by people aged 2 years and older — NWS-07”, “Reduce consumption of added sugars by people aged 2 years and over — NWS-10”, and “Increase fruit consumption by people aged 2 years and over — NWS-06.”<sup>11</sup> Reducing added sugar consumption is marked as a Leading Health Indicator, meaning it is marked as high priority among the Healthy People 2030 goals.<sup>11</sup> I choose a population of Oregon youth because adolescents are at a unique time of beginning to have more control over their diet

## Increase Fruit, Vegetables and Decrease Added Sugar

and they begin to form habits that often continue into their adult lives.<sup>12</sup> A number of strategies exist for behavior change in youth, including policy, increased accessibility, and education.<sup>12-14</sup> Actual statistically significant increase in the frequency of vegetable consumption and the servings of fruit were shown with school based nutrition education programs.<sup>13</sup> This suggests that a one-time education talk on nutrition if part of a larger nutrition curriculum will increase the amount of vegetables and fruit eaten by adolescents. A lack of fruit and vegetables and an excess of added sugar in diets is a public health issue impacting the nation and world.<sup>1-3</sup> Poor diet increases your risk of developing cardiovascular disease, diabetes mellitus, and obesity.<sup>3,5,6</sup> Adolescents are at a particularly influential time where lifelong habits are forming and they are gaining increased freedoms.<sup>13</sup> Therefore, educating adolescents on decreasing added sugars and increasing fruits and vegetables can help prevent chronic diseases and help adolescents start their lives as healthy adults.

### **Recommended Amount of Fruits and Vegetables**

The US Department of Agriculture's MyPlate, which provides healthy dietary recommendations for Americans based off Dietary Guidelines for Americans 2020-2025<sup>4</sup>, recommends eating between 1.5 – 2.5 cups of fruit daily for those aged fourteen and up.<sup>15</sup> Meanwhile the daily recommended amount of vegetables are 2.5-4 cups for those aged fourteen and up.<sup>15</sup> The breakdown on MyPlate is classified by boys, girls, men, women, and then specific breakdown recommendations of adults in the men and women groups.<sup>15</sup> A more accurate way to estimate an individuals recommended amount of fruit or vegetable intake can be completed on the MyPlate website by entering age, sex, weight, and amount of physical activity.<sup>15</sup> The MyPlate website then gives specific recommended amounts of all the food groups.<sup>15</sup> Most of us don't eat our food in terms of cups of fruit or vegetables, therefore the MyPlate website describes some common

## Increase Fruit, Vegetables and Decrease Added Sugar

amounts in terms more understandable.<sup>15</sup> Here are some examples that all count as one cup of fruit: one small apple, one banana, ten dates, twenty two seedless grapes, one large orange, eight large strawberries, one slice of watermelon, one small papaya, and two to three kiwifruits.<sup>15</sup> Here are some examples that all count as one cup of vegetables: one large ear of corn, one medium white potato, one large sweet potato, two large stalks of celery, five cactus pads, one avocado, two medium carrots, and one large tomato.<sup>15</sup> Uncooked dark green vegetables such as arugula, kale, bok choy, chard all count as half a cup per one cup (if cooked, one cup counts as one cup).<sup>15</sup> Beans, peas and lentils find themselves in both the protein and vegetable categories, and include options such as black beans, fava beans, pigeon beans, soy beans, split peas and various lentils.<sup>15</sup> Fruit and vegetable juices are included as well, but recommendations are to prioritize whole vegetables and fruits the majority of the time.<sup>15</sup> While eating fresh fruits and vegetables may be the best form of nutrients, evidence suggests that contained nutrients are often very similar despite the freezing, cooking, canning of vegetables and fruits.<sup>9,10,15</sup> It is important to note that as fruits and vegetables are canned, it is very common to add processed sugar and salt, both of which are often consumed above the recommended amounts.<sup>9,10</sup> One solution is to buy “no salt added” canned vegetables and canned fruit without added sugar in the form of “syrup”.<sup>9,10</sup> In summary and for ultimate simplicity sake – the goal is roughly to fill half of your plate with fruits and vegetables, with vegetables making up slightly more than fruit.

## **How Plants Fit into a Healthy Diet**

Eating plants (vegetables and fruits) are essential elements of nutritious diets that ultimately help people live longer and prevent chronic diseases.<sup>5,16-18</sup> The additional dietary components found to decrease all-cause mortality include nuts, whole grains, fish, and unsaturated vegetable oils.<sup>5</sup> Meanwhile low intake of animal products (such as red meat, high fat dairy, and processed

## Increase Fruit, Vegetables and Decrease Added Sugar

meats), low amounts of added sugar and low amounts of refined non whole grains are also associated with a decrease in all-cause mortality.<sup>5</sup> There are often discussions about the details of certain diets or specific discrepancies about what evidence supports any given specific diet. The evidence for certain diets can be mixed. For example, a Cochran systematic review reports that the evidence for primary and secondary prevention of cardiovascular disease by eating a Mediterranean diet is still unclear.<sup>17</sup> Sometimes these debates shift away from the simplicity of the basics provide and detract from the monumental shift over that past century in American diets. Nevertheless, there is a clear message for preventing cardiovascular disease per the ACC / AHA 2019 guidelines – “The most important way to prevent atherosclerotic vascular disease, heart failure, and atrial fibrillation is to promote a healthy lifestyle throughout life.”<sup>18</sup> The healthy lifestyle outlined in the guidelines includes the previously mentioned dietary recommendations shown to decrease all-cause mortality.<sup>18</sup>

### **Why Fruits and Vegetables are Healthy**

Fruits and vegetables contain a number of healthy components including vitamins, minerals, antioxidants, soluble and insoluble fiber, and water.<sup>9,10</sup> Important micronutrients found in fruits and vegetables include vitamin A, C, E and B vitamins (including folate).<sup>9,10,15</sup> These vitamins are essential for many human processes.<sup>9,10,15</sup> Fruits are often rich in potassium which can help maintain a normal blood pressure.<sup>15</sup> Additionally, fruits and vegetables are often high in fiber. Fiber is associated with decreased colorectal cancer risk.<sup>19,20</sup>

### **Why Added Sugar is Unhealthy**

Counter to the health benefits of eating vegetables and fruits is negative consequences of eating excess processed added sugar. Approximately three out of four American adolescents exceed the

## Increase Fruit, Vegetables and Decrease Added Sugar

recommended intake of added sugar.<sup>4</sup> Processed or added sugar being defined as refined sugar as opposed to sugars found naturally in whole foods is associated with a number of diseases.<sup>21</sup> Added sugar consumption is associated with diabetes mellitus, obesity, excess fat storage, gout, certain types of cancer, and dental caries.<sup>21</sup> Added sugar lacks other vital nutrients and is found in a number of packaged foods.<sup>3,4,21</sup> The largest source of added sugar for American youth is in the form of sweetened beverages such as soda, sugary sports drinks, fruit juice with added sugars, sweetened coffee and sweetened tea.<sup>3,4,21</sup> Americans consume 35% of their added sugar from sweetened beverages.<sup>3</sup> American adolescents consume 39% of their added sugar in the form of sweetened beverages.<sup>4</sup> Per the CDC, those over the age of two should consume no more than 10% of their calories from added sugars.<sup>3</sup> For a 2000 calorie diet this would equate to approximately 12 teaspoons of sugar.<sup>3,4</sup> For example, one soda is equal to approximately 10 teaspoons of sugar.<sup>3</sup>

### **Demographics on Target Audience**

I grew up in Dayton, Oregon located in Yamhill County about an hour's drive from Portland. The population of focus for my community outreach project will be high school students in Dayton High School (where I attended high school). Therefore, I have chosen to include some health indicators of Yamhill County. In Yamhill County, based on the most recent (2017) data on the Oregon Public Health Division website, 14.6% of adults report drinking more than seven sodas in a week, 13.7% of the population lives below the federal poverty level, of the 105,722 living in the county 493 are houseless, and 11.9% of the population is food insecure.<sup>22</sup> Well over half of the students at Dayton Grade School (71%) Dayton Jr High (60%), and Dayton High School (58%) qualify for free or reduced school lunches based on family income.<sup>23</sup> Dayton High School student demographics include 2% American Indian / Alaska Native, <1% Asian, 36%

Increase Fruit, Vegetables and Decrease Added Sugar

Latinx, 5% multiracial, and 56% White.<sup>24</sup> Yamhill County is a rural Oregon County per the Oregon Office of Rural health<sup>25</sup> and rural Americans tend to die earlier on average than their urban counterparts.<sup>26</sup> Additionally, rural counties in Oregon have a higher rate (4.9/1000 people) of houselessness than urban counties (3.0/1000 people).<sup>22</sup>

### **Interventions to Improve Healthy Diet**

The influences of diet are multifactorial and include culture, advertising, policies, availability, and income.<sup>12</sup> While the multifactorial influences on diet should not be ignored, education is the intervention of choice for the goals of this project. Advertising ultra processed foods is a major industry.<sup>27</sup> According to the UConn Rudd Center for Food Policy and Health, “Food, beverage and restaurant companies spend almost \$14 billion per year on advertising in the United States. More than 80% of this advertising promotes fast food, sugary drinks, candy, and unhealthy snacks...”<sup>27</sup> Adolescents and communities of color, are particularly targeted by this advertising.<sup>12,27</sup> Unhealthy food advertising is ubiquitous. For example, in my own hometown of Dayton, Oregon the sports scoreboard is sponsored by a soda company. This may seem like a benign interjection, yet it offers an example of how widespread ultra processed food and drink advertising is. Nevertheless, if adolescents are susceptible to the advertising of ultra processed foods they also are more likely to change their behavior in general and diets in particular.<sup>12</sup> For example, those who adopt a vegan diet are most likely to do so as a teenager or in their twenties.<sup>12</sup> Additionally, those who immigrate to the US as children are more likely adopt unhealthy diets compared to immigrant adults (those aged > 25 years)<sup>28</sup>, which again suggests that children and adolescents are at a period of susceptibility where dietary habits are more likely to change. Adolescents tend to be influenced by their peers, focused on self-identity formation, and shorter term thinking.<sup>12</sup> Therefore, educational content should not be focused solely on

## Increase Fruit, Vegetables and Decrease Added Sugar

prevention of chronic diseases as this may not resonate with adolescents like it may for adults.<sup>12</sup>

The CDC offers guidance on what comprises an effective health education curricula including such elements as skill building, clear goals and outcomes, addressing social pressures and norms, culturally inclusive, repeated offerings over years, and facilitate connections with positive role models.<sup>29</sup> In a meta-analysis systematic review of the effectiveness of school-based education on fruit and vegetable consumption in adolescents, the authors concluded that school-based education on diet has a favorable impact on fruit and vegetable consumption.<sup>13</sup> Analysis found a statistically significant increase of the frequency of vegetable consumption and the servings of fruit.<sup>13</sup> The significant dietary improvements were more noticeable in the near term (<1 year) and therefore the authors conclude that frequent and repeated education is an important component of long term dietary behavior change.<sup>13</sup> Health professionals can be a trusted source of dietary information and therefore can be a valuable component to a school based diet education program.<sup>12</sup> In one example, two different school based teen healthy eating education curriculums focused on low income communities.<sup>30</sup> These programs were six and eight weeks in duration, and both showed to have statistically significant increases of fruit and vegetable consumption and decreased added sugar consumption (based on the survey of behaviors).<sup>30</sup> Curriculum in these programs include food preparation skills, benefits of exercise, information on food choices, a free water bottle, and interactive activities.<sup>30</sup> Another idea is to facilitate an exercise in nutritional labels. While a slightly older age demographic, one study found university students who regularly read nutrition labels also eat healthier foods than those that do not regularly read nutrition labels.<sup>31</sup> While not practical for a one time visit, school gardens have been effective in teaching students about healthy diets.<sup>12</sup> Connecting adolescents with local food suppliers and local farmers, especially in rural areas where farms are located, may be another strategy to help

## Increase Fruit, Vegetables and Decrease Added Sugar

improve the diet of adolescents.<sup>12</sup> Some of these elements will not be possible in a onetime presentation. I will not be able to conduct a six-to-eight-week educational curriculum.

Nevertheless, the above evidence suggests that a one-time interactive presentation including healthy meal preparation skills can be part of a longer-term healthy eating educational program, especially if focused adolescent specific benefits of healthy eating such as performing in sports, maintaining a healthy body, and having energy to perform in school or life.

## Conclusion

A nutritious diet is an essential component to healthy living for all people.<sup>1,2,4,5,7,14,18,21,32</sup> The majority of people living in America do not eat the recommended amount of fruits and vegetables and eat too much added sugar.<sup>4</sup> Therefore, Healthy People 2030 created specific goals to increase the amounts of fruit, vegetables and decrease the amount of added sugar for all people aged two and older.<sup>11</sup> Diets high in fruits and vegetables and low in added sugar correlate with living longer and reduce the likelihood of developing many chronic diseases, including cardiovascular disease, the number one killer in America.<sup>4,5,7,19</sup> American adolescents are a particularly important target audience they eat less of recommended foods than any other age group.<sup>4</sup> Adolescents tend to be more open to change than adults and changes to dietary habits in youth may last a lifetime.<sup>12</sup> Additionally, my target audience of Dayton High School students include being rural (which is associated with dying earlier)<sup>26</sup> and a high rate of low income families (as estimated based on qualifying for free and reduced lunches)<sup>23</sup>, which are important social determinates of health. Optimistically, interactive school based adolescent education programs are effective at increasing fruit and vegetable consumption.<sup>12,13</sup> In conclusion, reducing added sugar and increasing fruit and vegetable consumption is vital for health and can be achieved in the rural Oregon adolescent population in part through school based education.

## References

1. Lange SJ, Moore LV, Harris DM, et al. Percentage of Adolescents Meeting Federal Fruit and Vegetable Intake Recommendations - Youth Risk Behavior Surveillance System, United States, 2017. *MMWR Morb Mortal Wkly Rep*. Jan 22 2021;70(3):69-74. doi:10.15585/mmwr.mm7003a1
2. Moore LV, Thompson FE, Demissie Z. Percentage of Youth Meeting Federal Fruit and Vegetable Intake Recommendations, Youth Risk Behavior Surveillance System, United States and 33 States, 2013. *J Acad Nutr Diet*. Apr 2017;117(4):545-553.e3. doi:10.1016/j.jand.2016.10.012
3. Center for Disease Control. Be Sugar Smart: Limiting Added Sugars Can Improve Health (CDC). 2022. Accessed November 25, 2023. <https://www.cdc.gov/nutrition/data-statistics/be-sugar-smart.html>
4. Phillips JA. Dietary guidelines for Americans, 2020–2025. *Workplace health & safety*. 2021;69(8):395-395.
5. English LK, Ard JD, Bailey RL, et al. Evaluation of Dietary Patterns and All-Cause Mortality: A Systematic Review. *JAMA Netw Open*. Aug 2 2021;4(8):e2122277. doi:10.1001/jamanetworkopen.2021.22277
6. Meng Y, Li S, Khan J, et al. Sugar- and Artificially Sweetened Beverages Consumption Linked to Type 2 Diabetes, Cardiovascular Diseases, and All-Cause Mortality: A Systematic Review and Dose-Response Meta-Analysis of Prospective Cohort Studies. *Nutrients*. Jul 30 2021;13(8)doi:10.3390/nu13082636
7. World Health Organization. Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases. Accessed November 24, 2023. <https://www.who.int/tools/elena/interventions/fruit-vegetables-ncds>
8. Center for Disease Control. Heart Disease and Stroke CDC. 2022, September. Accessed November 23, 2023. <https://www.cdc.gov/chronicdisease/resources/publications/factsheets/heart-disease-stroke.htm>
9. Rickman J, Bruhn C, Barrett D. Nutritional comparison of fresh, frozen, and canned fruits and vegetables II. Vitamin A and carotenoids, vitamin E, minerals and fiber. *Journal of the Science of Food and Agriculture*. 05/01 2007;87:1185-1196. doi:10.1002/jsfa.2824
10. Rickman JC, Barrett DM, Bruhn CM. Nutritional comparison of fresh, frozen and canned fruits and vegetables. Part 1. Vitamins C and B and phenolic compounds. *Journal of the Science of Food and Agriculture*. 2007;87(6):930-944.
11. US Dept of Health and Human Services -- Office of Disease Prevention and Health Promotion. Healthy People 2030 Nutrition and Healthy Eating. Accessed November 23, 2023. <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating>
12. Hargreaves D, Mates E, Menon P, et al. Strategies and interventions for healthy adolescent growth, nutrition, and development. *Lancet*. Jan 8 2022;399(10320):198-210. doi:10.1016/s0140-6736(21)01593-2
13. Medeiros G, Azevedo KPM, Garcia D, et al. Effect of School-Based Food and Nutrition Education Interventions on the Food Consumption of Adolescents: A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. Aug 24 2022;19(17)doi:10.3390/ijerph191710522
14. Marshall AN, Ranjit N, van den Berg A, Gill M, Hoelscher DM. Associations between variety of fruits and vegetables consumed, diet quality, and sociodemographic factors among 8(th) and 11(th) grade adolescents in Texas. *Public Health Nutr*. Aug 18 2022:1-25. doi:10.1017/s1368980022001690
15. United States Department of Agriculture. What is MyPlate? MyPlate. Website. Accessed November 23, 2023. <https://www.myplate.gov/eat-healthy/what-is-myplate>

## Increase Fruit, Vegetables and Decrease Added Sugar

16. Molina-Montes E, Ubago-Guisado E, Petrova D, et al. The Role of Diet, Alcohol, BMI, and Physical Activity in Cancer Mortality: Summary Findings of the EPIC Study. *Nutrients*. Nov 28 2021;13(12)doi:10.3390/nu13124293
17. Rees K, Takeda A, Martin N, et al. Mediterranean-style diet for the primary and secondary prevention of cardiovascular disease. *Cochrane Database Syst Rev*. Mar 13 2019;3(3):Cd009825. doi:10.1002/14651858.CD009825.pub3
18. Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. Sep 10 2019;140(11):e563-e595. doi:10.1161/cir.0000000000000677
19. Kunzmann AT, Coleman HG, Huang WY, Kitahara CM, Cantwell MM, Berndt SI. Dietary fiber intake and risk of colorectal cancer and incident and recurrent adenoma in the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial. *Am J Clin Nutr*. Oct 2015;102(4):881-90. doi:10.3945/ajcn.115.113282
20. Peters U, Sinha R, Chatterjee N, et al. Dietary fibre and colorectal adenoma in a colorectal cancer early detection programme. *Lancet*. May 3 2003;361(9368):1491-5. doi:10.1016/s0140-6736(03)13173-x
21. Huang Y, Chen Z, Chen B, et al. Dietary sugar consumption and health: umbrella review. *Bmj*. Apr 5 2023;381:e071609. doi:10.1136/bmj-2022-071609
22. Oregon Health Authority Public Health Division. State Health Assessment and Indicators. Accessed November 26, 2023. <https://www.oregon.gov/oha/PH/About/Pages/HealthStatusIndicators.aspx>
23. Oregon State Government. Free and Reduced Price Eligibility of Oregon Public Schools. March, 2023. Accessed November 26, 2023. <https://www.oregon.gov/ode/students-and-family/childnutrition/cacfp/Documents/2023%20Site%20Eligibility%20for%20CACFP%20and%20SFSP.pdf>
24. Oregon Department of Education. OREGON AT-A-GLANCE SCHOOL PROFILE Dayton High School 2023. Accessed November 26, 2023. <https://www.ode.state.or.us/data/reportcard/reports.aspx>
25. Oregon Office of Rural Health. Oregon Office of Rural Health -- Maps. Accessed November 26, 2023. <https://www.ohsu.edu/oregon-office-of-rural-health/maps>
26. Abrams LR, Myrskylä M, Mehta NK. The growing rural-urban divide in US life expectancy: contribution of cardiovascular disease and other major causes of death. *Int J Epidemiol*. Jan 6 2022;50(6):1970-1978. doi:10.1093/ije/dyab158
27. University of Connecticut. Food Marketing (UConn Rudd Center for Food Policy and Health). Accessed November 26, 2023. <https://uconnruddcenter.org/research/food-marketing/#a1>
28. Van Hook J, Quirós S, Dondero M, Altman CE. Healthy Eating among Mexican Immigrants: Migration in Childhood and Time in the United States. *J Health Soc Behav*. Sep 2018;59(3):391-410. doi:10.1177/0022146518788869
29. Center for Disease Control. Characteristics of an Effective Health Education Curriculum. Updated May 2019. Accessed November 26, 2023. <https://www.cdc.gov/healthyschools/sher/characteristics/index.htm>
30. Berman S, Williams T, Berg A, Brigman T, Yli-Piipari S, Henes ST. Comparison of Two Nutrition Curricula in Promoting Nutrition Behavior Change in Teens Participating in UGA EFNEP. *Journal of Nutrition Education and Behavior*. 2023/07/01/ 2023;55(7, Supplement):95. doi:<https://doi.org/10.1016/j.jneb.2023.05.205>
31. Buyuktuncer Z, Ayaz A, Dedebayraktar D, Inan-Eroglu E, Ellahi B, Besler HT. Promoting a Healthy Diet in Young Adults: The Role of Nutrition Labelling. *Nutrients*. Sep 20 2018;10(10)doi:10.3390/nu10101335

## Increase Fruit, Vegetables and Decrease Added Sugar

32. Greer FR. Healthy Nutrition: Adolescents. In: McInerney TK, Adam HM, Campbell DE, et al, eds. *American Academy of Pediatrics Textbook of Pediatric Care*. American Academy of Pediatrics; 2016:0.