

# THE HEN POST

## Hunger and Environmental Nutrition



a dietetic practice group of the  
Academy of Nutrition  
and Dietetics

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### FEATURED ARTICLE:

PER-AND POLYFLUOROALKYL  
SUBSTANCES (PFAS): WHAT THEY  
ARE, WHERE THEY ARE FOUND,  
AND HOW TO LIMIT EXPOSURE

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A RECIPE TO REDUCE  
FOOD WASTE

FACTORS AFFECTING COLLEGE  
STUDENTS' FOOD AND  
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### HEN MISSION

To empower members to be leaders in sustainable and accessible food and water systems

### HEN VISION

To optimize the nation's health by promoting access to nutritious food and clean water from a secure and sustainable food system

### THE BENEFITS OF HEN MEMBERSHIP INCLUDE:

- Quarterly newsletter with occasional CEU articles and reproducible fact sheets.
- Access to the HEN Electronic Mailing List (EML) that provides the latest information and relevant conferences.
- Subscription to the Journal of Hunger & Environmental Nutrition published by Taylor and Francis.
- Member-only access to articles and resources via the HEN website — [www.hendpg.org](http://www.hendpg.org).
- Collaboration with food and nutrition professionals across the United States and the world.
- Opportunity to be nominated for HEN awards.
- Notices of related conferences around the country.
- Potential for national and international recognition when working on HEN projects.
- Eligible to vote in HEN Executive Committee election.



# MESSAGE FROM THE CHAIR

## HELLO HEN COMMUNITY,

I am writing this message to you on Earth Day 2024 and wishing each of you a peaceful, refreshing ascent into Spring.

Today, I had the honor of speaking with a group of New England dietetic interns about the many ways that sustainability intersects with a career in food and nutrition. Regardless of your path, your proximity to food, health, and education systems as a dietitian makes you a uniquely powerful agent to build a more climate-positive, nourishing future for all.

That proximity comes with great responsibility and even more incredible opportunity. Each of us has a moral obligation to remember one simple truth:

You matter.

Your voice matters.

Your choices matter.

Your thoughtfully sustained hope for a livable future on Earth matters.

In fact, you more than matter.

Your daily engagement in more equitable, efficient, and community-

based, climate-smart solutions is *required* to fulfill our obligation to leave the Earth better than we found it for future generations.

In the bustle of day-to-day living, it becomes easy to forget our proximity to Earth — our symbiotic reliance upon our planet, its natural systems, and all living beings with whom we share this space.

Today, please step outside, take a deep breath of fresh air, and pause. Share a moment with me to remember, respect, and honor the continuum of life that connects and sustains us. The hands that grew the food on our plates, the soil that nourished its roots, the history of the land that dwells in those roots, the sustenance that food brings our bodies and communities — and your perfectly placed role within it all.

*Who* do you want to be in that grand continuum?

*How* can you practice daily engagement toward the impact you hope to have?

*With whom* can you share your ideas, reflections, and aspirations to deepen our collective impact and remain hopeful on the more challenging days?

We are honored to nurture a space for your impact here at HEN, and I am so grateful to have served as your HEN Chair from 2023-2024. This community is a constant source of personal and professional inspiration to me, and as you'll see in this edition of the HEN Post, we have been hard at work. From an in-depth review of the planetary health effects of per- and polyfluoroalkyl substances (PFAS), to a spotlight on a HEN dietitian's role in hosting nutrition-centered gardening classes, and seasonal recipes to reduce household wasted food, may we all continue to expand and deepen our impact toward a more livable, nourishing future for all.

I am thankful for every one of you at HEN. Your presence in this practice group communicates your commitment to co-creating solutions for the greatest challenges of our time, with resilience, hopefulness, and community care.

Keep going. You matter. We matter.

Onward in Solidarity,

*Ayten*



## PER-AND POLYFLUOROALKYL SUBSTANCES (PFAS): WHAT THEY ARE, WHERE THEY ARE FOUND, AND HOW TO LIMIT EXPOSURE

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### INTRODUCTION

**P**er- and polyfluoroalkyl substances (PFAS) are a large group of synthetic chemicals characterized by a chain of carbon atoms bound to fluorine atoms through a process called fluorination.<sup>1</sup> PFAS are a class of thousands of chemicals known or suspected to be endocrine-disrupting chemicals. According to the Endocrine Society and the International Pollutants Elimination Network (IPEN), “Endocrine disrupting chemicals are individual substances or mixtures that can interfere with our hormones’ natural functioning, leading to disease or even death.”<sup>2</sup> PFAS are called “forever chemicals” because they

don’t biodegrade. Instead, PFAS accumulate in the environment and our bodies over time.<sup>3</sup> They are used to make consumer products nonstick, oil- and water-repellent, and resistant to temperature change. PFAS are used in many consumer products such as food packaging, nonstick cookware, water-repellent clothing, personal care products, and cosmetics (e.g., shampoo, dental floss, nail polish, eye makeup) as well as paints, sealants, stain-resistant carpets, upholstery, and other fabrics.<sup>3-5</sup>

Exposure to PFAS is associated with decreased infant and fetal growth as well as decreased antibody response to vaccines in both adults and children, according to a report by the U.S. *National Academies of Sciences,*

*Engineering, and Medicine* (NASEM).<sup>6</sup> Some of the most studied PFAS, such as PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonic acid), have been linked to serious health problems such as cancer, obesity, thyroid disease, high cholesterol, decreased fertility, pregnancy-induced hypertension, birth defects, liver damage, altered immune response, and hormone disruption.<sup>2,7,8,9</sup> Studies are now finding similar health impacts from some of the newer PFAS. The NASEM has called for people at higher risk, such as pregnant women, young children, and the elderly, to be tested for a subset of PFAS chemicals.<sup>6</sup>

In April 2024, the American Heart

Association (AHA) published a scientific statement on environmental exposures and pediatric cardiology, which stated: “ample evidence identified to date connecting EDCs [endocrine-disrupting chemicals] and childhood cardiovascular risk factors is especially remarkable given the many challenges of the field.”<sup>9</sup> The AHA concluded there is “[a] need for clinicians, research scientists, and policymakers to focus more on the linkages of environmental exposures with cardiovascular conditions in children and adolescents.” Finally, in this scientific statement, it is reflected that improvements in reducing environmental exposures have not occurred in an equitable manner<sup>9</sup> as exposures to endocrine-disrupting chemicals disproportionately affect racial minorities, low-income communities, and other disadvantaged groups.<sup>10</sup> As such, envi-

ronmental health is a core feature of social and environmental justice.<sup>9-10</sup>

## HOW ARE WE EXPOSED TO PFAS?

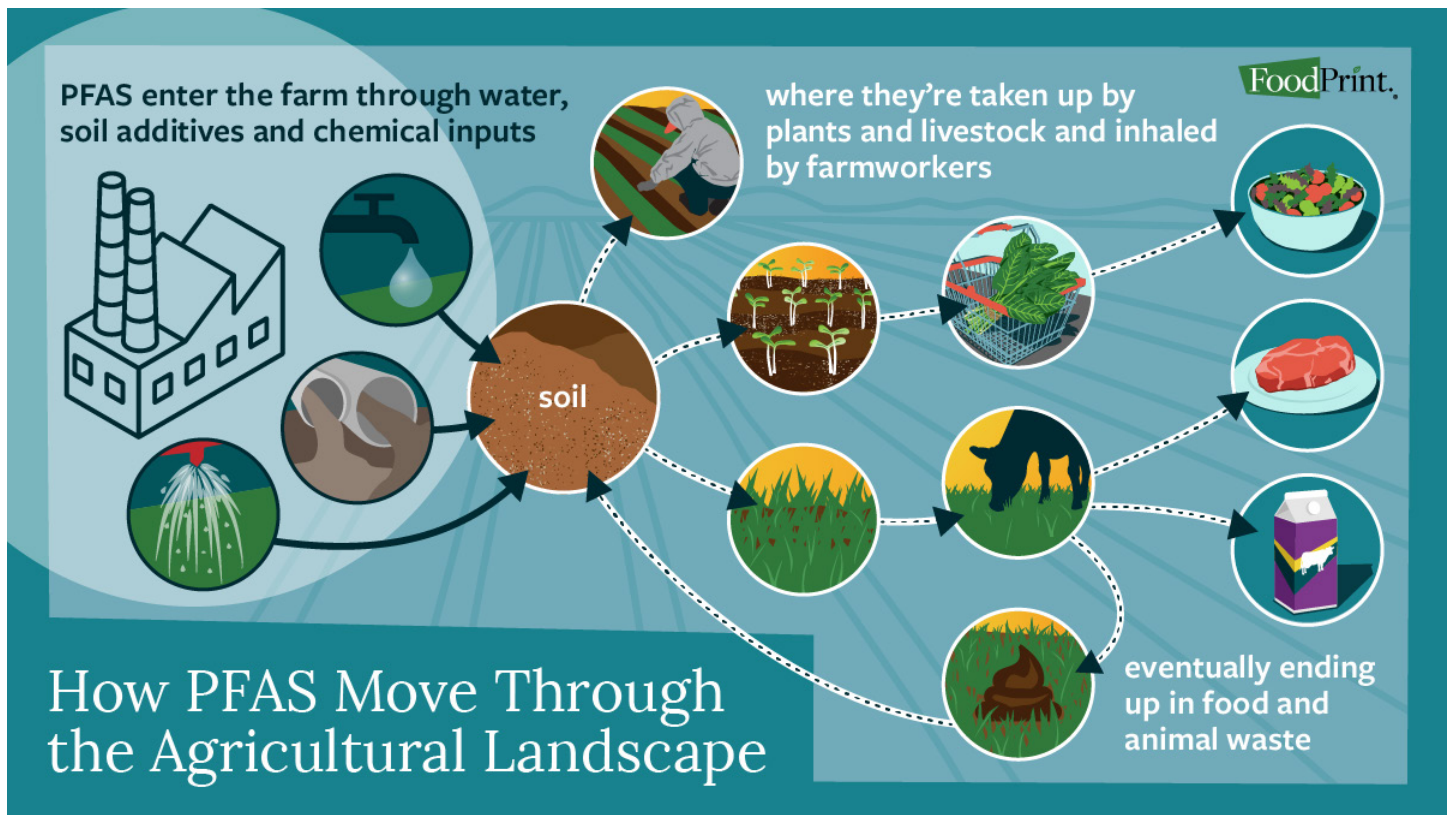
Individuals are exposed to PFAS in numerous ways including:

1. Drinking water from PFAS-contaminated municipal sources or private wells
2. Eating fish caught from water contaminated by PFAS (PFOS, in particular)
3. Eating food products such as meat, dairy, and vegetables produced near locations where PFAS were used or made
4. Eating food packaged in material that contains PFAS

5. Accidentally swallowing or breathing contaminated soil or dust
6. Accidentally swallowing residue or dust from consumer products such as stain-resistant carpeting and water-repellent clothing, and
7. Ingestion of residue and dust from PFAS-containing products<sup>4</sup>

PFAS can enter a farm through water, soil additives, sewage sludge, and synthetic chemicals, such as pesticides. They are then taken up by plants and livestock and inhaled by farmworkers and farmers. Eventually, they end up in food and animal waste.<sup>1</sup> See Figure 1 for an overview of how PFAS move through the agricultural landscape.

**Figure 1. How PFAS Move Through the Agricultural Landscape<sup>1</sup>**



Reprinted with permission from [FoodPrint.org](https://www.foodprint.org). The permission to use the graphic is in accordance with Foodprint.org's [Terms and Conditions](#). You can review the FoodPrint of PFAS Report [here](#), which is mentioned in [their podcast episode](#) on the subject.

A recent study found that greater consumption of processed meats, tea, and food prepared outside of the home was associated with increased levels of PFAS in the body over time.<sup>11-13</sup> Processed meats could be contaminated with PFAS during the manufacturing process.<sup>13-14</sup> Some foods analyzed were only associated with higher PFAS levels when they were prepared outside the home. People who ate foods such as French fries or pizza prepared at restaurants typically showed increased levels of PFAS (forever chemicals) in their blood. The researchers suggested that food packaging was the problem.<sup>13</sup> The authors of this study observed the strongest associations between PFAS concentrations (more specifically, PFOA, one of the most well-studied types of PFAS) and heightened pork and tea intake.<sup>11-13</sup>

These researchers noted that the association between high levels of PFAS and tea intake could be linked to tea bags treated with PFAS chemicals (forever chemicals) - although more research is needed.<sup>13,15</sup> In 2023, a study analyzing 108 tea bag samples collected from the Indian market found that PFOS, PFHxS, and PFuNA (PFAS chemicals) "were abundantly present in the tea bag powder and tea bag material." Ninety percent of the tea bags contained detectable concentrations of PFAS.<sup>15</sup> The research team at the Keck School of Medicine of the University of Southern California is currently "conducting research on the extent of PFAS contamination in popular tea brands as well as a follow-up study on diet and PFAS levels in a multi-ethnic group of participants."<sup>11</sup>

Switzerland's Food Packaging Forum Foundation identified 68 PFAS 'forever chemicals' in food packaging including plastic, paper, and coated metal packaging. Of the 68 identified PFAS compounds, 61 had been previously banned for use in food packaging. These

researchers identified hazard data that was available for 57% of the PFAS compounds detected in food packaging.<sup>16-17</sup> Based on their assessment, they concluded that "the data and knowledge gaps presented here support international proposals to restrict PFASs as a group, including their use on food contact materials, to protect human and environmental health."<sup>16</sup>

On February 28, 2024, the US Food and Drug Administration (FDA) announced that "grease-proofing substances containing [Per and Polyfluoro-alkyl Substances \(PFAS\)](#) are no longer being sold by manufacturers for food contact use in the U.S. market."<sup>18</sup> This means that paper food packaging, including fast-food wrappers, microwave popcorn bags, and take-out pizza boxes, is no longer being made with certain kinds of grease-proofing PFAS. The voluntary phase-out eliminated the main source of exposure from our diets, according to the agency. However, there are lingering stocks of packaging that contain PFAS that could take months to be exhausted.<sup>3</sup>

New research published in *Nature Geoscience* found that PFAS (perfluoroalkyl and polyfluoroalkyl substances) are found in surface and groundwaters around the world at levels much higher than many international regulators allow. Scientists analyzed available data from more than 45,000 water samples around the world since 2004.<sup>19</sup> Groundwater can be contaminated by PFAS from food and consumer products disposed of in landfills, manufacturing facilities, and wastewater treatment plants (sewage treatment plants).<sup>19-20</sup>

On April 10, 2024, the U.S. Environmental Protection Agency (EPA) announced new standards for the regulation of PFAS chemicals in drinking water. The limits, known as maximum contaminant levels, or MCL, are the

highest level of contaminant allowed in drinking water. These limits consider health concerns and water treatment costs and feasibility. The new MCL require water treatment plants to lower the amount of these chemicals to safer levels than currently exist in water systems.<sup>21</sup> The new rules require municipal water systems to track and monitor the levels of PFAS, provide \$1 billion in funding available to local governments to test and treat public water systems, and help owners of private wells address PFAS contamination. Water officials have 5 years to comply with the new limits.<sup>3</sup> Public health advocates say the rules are an important first step, but are limited in their impact on the broader [PFAS](#) crisis. The new rules address only six compounds while about 15,000 PFAS exist, and the vast majority remain unregulated or unstudied. Drinking water represents only about 20% of human exposure, the [EPA estimates](#), and diet is most likely a greater source of exposure.<sup>22</sup>

## HOW TO LIMIT EXPOSURE TO PFAS CHEMICALS

*Filter your tap water.* Reverse osmosis filters are the most effective. To remove a specific contaminant such as PFAS from drinking water, consumers should choose a water filtration device that is independently certified to remove a contaminant by a recognized lab.<sup>23</sup> Reputable third-party testing organizations include NSF, formerly known as, the National Sanitation Foundation (NSF), Water Quality Association (WQA), International Association of Plumbing & Mechanical Officials (IAPMO), UL Solutions, CSA Group, and Intertek (ETL). For a filter that can remove PFAS, look for one with the code NSF/ANSI 53, or NSF/



ANSI 58 for reverse osmosis systems, followed by the manufacturer's claim that the product can remove PFAS.<sup>23</sup> NSF has a list of recommended filters available at: [nsf.org](https://www.nsf.org). The Environmental Working Group (EWG) has also published a guide with recommendations on the most effective water filters for reducing PFAS, which is available here: [EWG's guide to PFAS water filters](#).

There are no standards for PFAS in bottled water.<sup>4</sup> Save money, skip the plastic, and drink filtered tap water instead of bottled water.

**Food, food packaging, and tea bags.** PFAS compounds can bioaccumulate in crops, fish, and livestock.<sup>1</sup> PFAS are used to make food packaging such as paper plates, bowls, bags, some plastic packaging, sandwich wrappers, and other types of packaging to make them water- and oil-resistant. A recent study

found higher PFAS levels in certain foods prepared in restaurants such as pizza and French fries.<sup>13</sup> To reduce your exposure to PFAS:

1. Skip microwave popcorn – pop your own popcorn instead – either with a hot air popper or on the stove
2. Limit consumption of highly processed meats (e.g. hotdogs)
3. Limit food packaged in paper board and paper-based takeout packaging such as pizza
4. Limit fast foods prepared at restaurants such as pizza and French fries
5. Prepare home-cooked meals more often<sup>5,13</sup>
6. Use uncoated paper products and products made from materials other than paper, such as bamboo<sup>24</sup>
7. To store food – at home and away from home, use glass instead of plastic containers.<sup>24-26</sup> Compostable containers, although plastic-free, may not be PFAS-free.<sup>24-25</sup> Look for compostable packaging that is BPI-certified.<sup>27-28</sup>
8. Tea bags treated with PFAS (forever chemicals) may be associated with increased levels of PFAS in the body over time, although more research is needed.<sup>13,29</sup> If this issue concerns you, purchase loose-leaf tea or prepare your own tea at home. Here are some ideas for do-it-yourself (DIY) tea blends: [DIY Tea Blends – 5 Ways](#)

For more information on how to limit PFAS exposure, visit Toxic-Free Future at: [toxicfreefuture.org](https://toxicfreefuture.org).

**Cookware.** If a pot or pan becomes damaged, consider a replacement. Through repeated use, non-stick cookware begins to scratch and chip. Use kitchen cookware free from PFAS including stainless steel, cast iron, ceramic, and glass. Carefully choose cookware. Beware of nonstick cookware that claims it's free of PFOA, a PFAS that has been phased out. The cookware may have just-as-toxic replacement chemicals.<sup>5,30</sup>

**Continue to breastfeed your baby.** Research suggests that the benefits of breastfeeding far outweigh the risks of potential PFAS exposure. Due to the many benefits of breastfeeding, the Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics (AAP) recommend that most nursing individuals continue to breastfeed.<sup>4</sup> The focus should be on reducing maternal exposure.<sup>30</sup> Infants can be exposed to PFAS from drinking formula that is mixed with PFAS-contaminated water.<sup>4,30</sup> To address this issue, use filtered tap water when preparing infant formula.

**Check fish, game, and agricultural advisories.** PFAS have been widely detected in locally caught freshwater fish in the United States. Check your local or state and environmental quality departments for fish or hunting advisories.<sup>4,30</sup> "National testing done by the U.S. EPA shows that nearly all fish in U.S. rivers and streams and the Great Lakes, have detectable PFAS, primarily PFOS." As such, "This is an example of social and environmental injustice facing communities that depend on catching fish for cultural practices or economic necessities."<sup>31</sup>

**If you consume seafood, do so as part of a balanced diet.** U.S. FDA test-

ing shows that seafood purchased at grocery stores have significantly lower levels of PFAS than self-caught freshwater fish.<sup>31</sup> "Though PFAS are more dilute in ocean water than they are in fresh water, marine life can also be contaminated."<sup>1</sup> In a recent study, scientists analyzed levels of 26 different forms of PFAS in salt and freshwater fish, including cod, haddock, lobster, salmon, scallops, shrimp, and tuna. They found that shrimp and lobster had the highest concentrations of PFAS, with averages ranging up to 1.74 and 3.30 nanograms per gram of flesh, respectively, for certain PFAS compounds. Concentrations fell to less than one gram of PFAS per gram for other types of seafood.<sup>32</sup> Based on these findings, the authors concluded, "high seafood consumers may be exposed to PFAS concentrations that potentially pose a health risk." They further stated that their findings support the "future development of environmental and health-based policies to protect people from exposure to PFAS found in commonly consumed seafood."<sup>32</sup>

**Clothing, textiles, and dust.** Purchase clothing items from companies that have made commitments to not use PFAS in their products. According to the Natural Resources Defense Council (NRDC), "The best way to find out whether your item of clothing is PFAS-free is to check the brand's website to see if it has announced that it has eliminated PFAS from its clothing or labeled clothing lines as PFAS-free."<sup>28</sup> If no information is available, contact customer service to ask directly. Review the brands covered on [NRDC's PFAS apparel scorecard](#). Also, you can check out [PFAS Central](#), a project of the Green Science Policy Institute, which offers a helpful list of products and brands that state they offer PFAS-free outdoor gear, apparel, and other products.<sup>28</sup>

Avoid waterproofing stain-proofing treatments, unless advertised as free of PFAS. Vacuum frequently using a vacuum fitted with a HEPA filter to eliminate household dust that may contain PFAS.<sup>4-5,33</sup> Opening windows can help filter out dust as well.<sup>33</sup>

While these are important steps consumers can take to limit exposure to PFAS, scientists believe they aren't enough to control PFAS contamination. Their pervasiveness in the environment makes it impossible to avoid exposure, according to Dr. Carmen Messerlian, a Professor of Reproductive Environmental Epidemiology at Harvard's T.H. Chan School of Public Health, who studies PFAS. Dr. Messerlian reflects that: "Even someone like me, a scientist and a mother who cares about human health, can't avoid PFAS chemicals. I can chip away and make choices in my day that reduce my exposure. But I'm looking at my fridge right now, and I can tell you most of my foods have come in contact with PFAS. We should regulate the entire class of chemicals and stop companies from manufacturing them to begin with, rather than try to regulate how much is in our water."<sup>33</sup>

For additional information, visit [A Consumer's Guide to PFAS: Side-Stepping 'Forever Chemicals' In Your Daily Life](#)

## TELL CONGRESS TO PROTECT FARMERS AND THE PUBLIC FROM PFAS

"The use of per- and polyfluoroalkyl substances (PFAS) in industrial and commercial applications has led to widespread contamination of water and biosolids used for fertilizer... posing a significant threat to the biosphere, public health, gardens, parks, and agricultural systems. Farmers and



rural communities, in particular, bear the brunt of this contamination, as it affects their drinking water, soil quality, and livestock health.”<sup>34</sup>

**[Tell Congress that the Farm Bill must include the Relief for Farmers Hit with PFAS Act and the Healthy H2O Act to protect farmers and rural communities from PFAS contamination.](#)**

“Led by [Representative] Chellie Pingree (D-ME), U.S. Senators Tammy Baldwin (D-WI), and Susan Collins (R-ME), [a bipartisan and bicameral bill](#)—the [Relief for Farmers Hit with PFAS Act](#)—has been introduced to provide assistance and relief to those affected by PFAS. A second bill, the [Healthy H2O Act](#), introduced by Representatives Pingree and David Rouzer (R-NC) and Senators Baldwin and Collins, provides grants for water testing and treatment technology directly to individuals and non-profits in rural communities.”<sup>34</sup>

## CONCLUSION

Per- and polyfluoroalkyl substances (PFAS) are present in a wide range of consumer products including food, water, and food packaging. They bioaccumulate in our bodies over time and may be associated with serious health problems. By taking the above action steps, you can reduce your exposure to PFAS. However, there is a need for ongoing monitoring, improved testing, and enhanced government regulation to address the widespread occurrence of PFAS contamination in the environment.

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## HEN POST SUBMISSION GUIDELINES

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If you are interested in writing an article about your work, about a resource you find helpful, or any topic you think HEN members would enjoy, please reach out to Brooklin White at [bswhite@usc.edu](mailto:bswhite@usc.edu) or Tamara Graham [tamaragraham2004@gmail.com](mailto:tamaragraham2004@gmail.com).

For more specific guidelines on article format, length, referencing, and additional information that must accompany articles, see the HEN website – [www.hendpg.org](http://www.hendpg.org). Log in as a member → “Member Center” → “HEN Post Newsletter”.

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# A RECIPE TO REDUCE FOOD WASTE: RADISH LEAF SOUP

BY DIANE SMITH, MA, RDN AND TEAM AT WASHINGTON STATE UNIVERSITY SKAGIT COUNTY EXTENSION

One recipe that helps reduce food waste is Radish Leaf Soup. By using stems and ends of foods, more of the food is enjoyed. For this recipe, the radish leaf is the star of the show. What to do with the radishes? Slice them thinly, sautee them in a bit of oil, and add a topping to the soup.

**DIFFICULTY: EASY**

**TIME NEEDED: 30 MINUTES**

**SERVINGS: 4**

## INGREDIENTS:

3 large bunches radishes  
1 tablespoon butter or olive oil  
1 very large white or yellow onion, chopped  
4 russet potatoes (about 1 1/2 pounds)  
peeled and chopped  
3 cups water  
2/3 cup milk or plant-based milk alternative

## DIRECTIONS:

1. Cut leaves from radishes and wash well (reserve radishes for another use).
2. Melt butter/olive oil in a large saucepan over medium heat. Add onion and saute until tender (about 3-5 minutes)
3. Add radish leaves and saute until wilted (about 2 minutes). Add potatoes and 3 cups water. Cover and simmer until vegetables are tender (about 20 minutes)
4. Puree soup using an immersion blender or in a regular blender (return soup to saucepan after blending). Mix in milk and stir over medium heat until hot.
5. Add salt and pepper to taste.
6. Serve hot and enjoy!



**Interested in more recipes to try that “waste less” and utilize scraps? Check out the following:**

- [The Scraps Online Book](#)
- [Lindsay-Jean Hard’s Cooking with Scraps Online Class](#)

# FACTORS AFFECTING COLLEGE STUDENTS' FOOD AND BEVERAGES CHOICES

BY XINBO DU, GRADUATE STUDENT AT THE USC LEONARD DAVIS SCHOOL OF GERONTOLOGY

## INTRODUCTION

Obesity has tripled globally since 1975, and according to data in 2022, 43% of adults aged 18 years and older were overweight, and 16% were obese.<sup>1</sup> The health risks caused by overweight and obesity have shown that a higher-than-optimal BMI caused an estimated 5 million deaths from noncommunicable diseases such as cardiovascular disease, diabetes, and cancer in 2019.<sup>1</sup> Research over the years has shown that diet is the number one predictor contributing to these health outcomes.<sup>2</sup>

Diet and health behaviors are known to shift substantially in young adulthood and can have considerable long-term health impacts.<sup>3</sup> For instance, diet patterns are learned in the home as children develop since parents/guardians often make the majority of food choices. However, food choices can be disrupted once young adults start college and live independently for the first time since they no longer have parents/guardians cooking for them and frequently lack the culinary skills and nutrition education that support making healthy food choices.<sup>4</sup> Parental/guardian guidance may also be dismissed once young adults go to college since food and beverage choices become influenced by college culture, convenience, stress, food insecurity, comparison, and, often, an unhealthy food environment.

University food environments typically offer many unhealthy food and beverage options.<sup>5</sup> For example, vending machines, which

contain an array of ultra-processed foods, are often placed in various food halls, academic buildings, dorms, and athletic centers. Even if college students want to eat healthfully, they may not have adequate access or know how to choose healthy food. Because there has been little research on the validity of dietary assessments among college students<sup>3</sup>, it is essential to recognize the factors affecting college students' food and beverage choices so that universities can create a healthier food environment.

## FACTORS AFFECTING COLLEGE STUDENTS' FOOD AND BEVERAGES CHOICES

### Food Environment

Most college students spend most of their time on campus, whether it be in a dorm-room setting, dining halls, libraries, or classrooms. One research study examining college students in the United States showed that food choices were heavily influenced by students' surroundings.<sup>4</sup> Vending machines, fast-food restaurants, coffee shops, and campus dining halls are common food options students can choose from. It has been found that 65% of snacks and drinks in vending machines have high levels of sugar, sodium, and saturated fat.<sup>4</sup> Intense class schedules and academic pressure often steer students toward these quick food options to save time.

Food on college campuses in the United States is often dominated by consumer preferences and economics

since there are no health regulations for college food, unlike in public elementary and high schools. Several studies examining the dietary behavior of college students have found that students who eat more frequently on campus have poorer diets, given much of the food sold on campus is unhealthy.<sup>6</sup> Similar to previous findings, students also reported difficulty finding healthy and affordable food on campus.<sup>6</sup> The data on college students' food choices are limited and generally come from college students' self-reports, such as 24-hour recalls and direct observation, which may have inevitable errors. Racine et al. worked with the University of North Carolina (UNC) at Charlotte and used student food sales data to assess student preferences, the impact of the food environment, policy changes on food purchasing behavior, and the impact of nutrition education interventions.<sup>6</sup> This research provided UNC Charlotte's campus marketing and dining departments with information that helped them better understand students' dietary preferences and needs. For instance, the students at UNC Charlotte are learning the negative impact a lack of healthy food options can have on their health and have expressed interest in including healthier food options in vending machines, such as dry roasted nuts and fresh fruit.<sup>4</sup> Hasan et al. found that student consumers are willing to purchase healthier options if available.<sup>4</sup>

### Gender and Race

Gender and race are significant factors that affect food choices. According to one study, men generally

saw cost as one of the most important determinants, while women were more likely to seek high-quality and low-fat options and have dietary restrictions due to weight and health concerns.<sup>5</sup> Another study found that due to societal and peer influences, voluntary food restriction has become a common practice among college students, predominantly female and transgender students.<sup>3</sup> A 2015 study found that transgender students were four times more likely than their cisgender female counterparts to report an eating disorder due to body dysmorphia.<sup>14</sup> A 2020 study showed that over a third of transgender and gender-nonconforming students followed a restricted diet to lose weight, and 31% engaged in binge eating over 12 months. Almost half of the participants attempted to lose weight, and 88% had altered their eating or exercise behaviors to change their body.<sup>15</sup>

Additional studies have shown that race and ethnicity also contribute to food choices. For instance,

Black female students were more likely to choose convenience and quick food options,<sup>5</sup> while white students' food choices were primarily affected by the fear of obesity.<sup>5</sup> It's important to note that these food choices are not only reflected by dietary habits learned in the home but also by socioeconomic status and systemic racism. A 2021 study found that first-generation Black college students had 296% higher odds of being food insecure compared to first-generation white students.<sup>16</sup> Additional evidence looking at Historically Black Colleges and Universities (HBCUs) has shown that nearly 73% of students were experiencing some level of food insecurity.<sup>17</sup>

### Food Cost, Availability, and Income

Although taste is a primary factor in college students' food choices, most choose based on cost and availability.<sup>5</sup> Healthy food is usually characterized by low availability and higher prices than unhealthy food options on college campuses.

The availability of fast food and the high price of fresh fruits and vegetables deter college students from choosing healthier food choices.<sup>18,19</sup> College students may also have difficulty paying for healthy food items due to a limited food budget, especially students who are working through school and need to prioritize paying tuition fees and rent. The recent COVID pandemic has also led to economic inflation that has made healthy fresh fruits and vegetables even less affordable,<sup>20</sup> which makes it more difficult for college students with limited budgets to choose healthy food options.

### Psychological

Stress is a global problem that has adverse effects on human health and has been shown to alter eating behavior, redirecting food choices toward foods with higher palatability and energy value, especially those high in sugar and fat.<sup>10</sup> College students are at a time of significant transition and are particularly prone to emotional imbalances, such as



stress and depression. Academic requirements, social demands, and the freedom and responsibility for food selection, purchase, and preparation can directly affect eating behavior and negatively impact food choices.<sup>10</sup> Penaforte et al. found that stress-induced eating was more common in women than men due to reports of increased chronic stress, which elevates cortisol levels and in turn, increases sensitivity to brain reward pathways (BRP).<sup>10</sup> When students feel pressure from school and society, they are more likely to choose fast food or other high-sugar and high-fat foods to relieve stress.

Data show that students with higher stress levels are more likely to engage in emotional eating and also uncontrolled eating.<sup>10</sup> These findings indicate that in situations of stress, food choices are more determined by emotional factors associated with the difficulty of controlling the amount ingested.<sup>10</sup> The increase in high-sugar and high-fat food choices naturally corresponds to a decrease in the intake of fresh vegetables and fruits, which can cause changes in the diet structure of college students and negatively affect future health.

## IMPACT OF FOOD CHOICES ON COLLEGE STUDENTS

### Academic Achievement

Several studies investigating college students' eating behaviors have reported that poor eating patterns are associated with lower academic achievement, higher psychological distress, and lower socioeconomic status.<sup>6,14</sup> Racine et al. found that students who had a higher GPA visited the dining halls more frequently ate less fast and ultra-processed food from University vendors.<sup>6</sup> On the contrary, a lower GPA was associated with spending more on fast food.<sup>6</sup> Additional research is needed to analyze the relationship between socioeconomic status, healthy diets,

and academic performance. For example, do students with better academic performance receive better nutrition education before college and thus pay more attention to food choices?<sup>2</sup> Or are they better financially supported by their parents/guardians and able to afford healthier food options?

### Future Health

When food choices are dominated by an unhealthy food atmosphere and the inability to access and afford healthier options, it can affect college performance and, ultimately, the direction of a student's life. Several studies show that food insecurity can cause college students to have lower GPAs, class attendance, and course completion rates.<sup>12,13</sup> These food-insecure students are also reporting increased stress and depression.<sup>21</sup> These factors contribute to unhealthy food choices and ultimately increase the risk of these students developing chronic diseases, such as heart disease, diabetes, and obesity.<sup>7</sup>

## CONCLUSION

In conclusion, gender, race, food environment, psychological status, social influences, cost, and economic status can all affect college students' food choices. The food environment significantly affects students' food choices, especially those who live on campus. The "Freshman 15" is commonly known due to the drastic change in the food environment and freedom for students to choose the foods they want. Many of the foods offered in college cafeterias and fast-food restaurants are highly processed items such as burgers, pizzas, fries, and fried chicken, making it difficult for students to choose healthy options. College students cannot be entirely focused on their academic pursuits if they have to work part-time outside the school to pay for their food, which may ultimately

affect academic performance and career direction. The increased rates of depression and anxiety across college campuses also affect dietary patterns and can lead students to choose more comforting and unhealthy options. Most factors that affect college students lead to unhealthy food choices and may contribute to long-term health consequences that negatively impact these students' lives. As nutrition professionals, we must continue to address how we can increase access to nutrition education and healthy, affordable food options on college campuses to help support a healthier future for students.

## AUTHORS NOTE

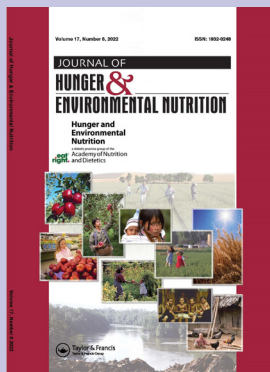
I noticed that my dietary patterns changed after going to college. I tend to choose fast foods or skip meals due to heavy schoolwork, especially during the midterm and final weeks. However, I have been fortunate enough to be food secure through my college education. One of my classmates had to work 20 hours per week to pay for her groceries and sometimes had to skip meals if her paycheck could not cover them. I have also noticed that the campus dining halls have few healthy dietary options, which makes it difficult to eat nutritious foods while living near campus.

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## HEN COMMUNITY GRANT AWARD - 2023

BY FERNANDA NUNES, RD

Fernanda Nunes, a HEN PPC leadership board member and RD at the Food is Medicine non-profit, [Project Open Hand](#) (based in the Bay Area of California) applied for and received the Community Grant Award from the Hunger and Environmental Nutrition Dietetic Practice Group (HEN DPG) in 2023. This grant is awarded to HEN members to support community-led programming related to school or community gardening, urban farming, food security, clean water access, or other HEN-aligned work.

With this award, Project Open Hand hosted a three-class indoor

gardening series for Project Open Hand clients. In each class, Project Open Hand clients learned about the human and planetary health benefits of incorporating microgreens, herbs, and green onions into their diet. They received resources and guidance on how to plant these items as a group. They were also given additional planting kits to grow more of these greens at home.

For the microgreen lesson, Project Open Hand received a discount from the local company [Back to Roots](#) to purchase microgreen growing kits. These kits came complete with all materials needed to grow microgreens at home, including seed

packets, compostable grow trays, soil, and growing guides.

For the herb lesson, various seeds were purchased including thyme, oregano, cilantro, parsley, lavender, basil, sage, dill, chives, Thai basil, rosemary, and mint. Project Open Hand clients received soil, pots, planting materials, and education on how to plant herbs from seeds and cuttings. Additionally, they received a booklet with educational material about each specific herb, including the herb life cycle (annual, perennial, or biennial), ideal amount of sunlight, germination period, culinary uses, flavor profile, and nutritional



content. This booklet also included recipes for each herb (see below for an example recipe).

For the green onion lesson, clients learned how to grow green onions

from cuttings. They were also taught how to reuse toilet paper rolls as recycled containers. In this final class, clients also received free food from a local restaurant, La Mediterranee, and enjoyed time socializing after the class.

Project Open Hand is grateful for the opportunity that HEN DPG's community award provided and plans to host a second-class series in our San Francisco location in 2024.

# Lavender



- Perennial
- Full sun to partial shade

14 - 21 days

Vitamin A • Calcium • Iron

Desserts • Fruits • Preserves  
• Syrups • Vinegar

Refreshing • Light oniony taste

## Whole Grain Zucchini Lemon Muffins

Makes 6 Muffins

### Ingredients:

#### Dry

- 3/4 cup white whole wheat flour
- 1/4 cup old fashion rolled oats
- 3/4 teaspoon baking powder
- 1/4 teaspoon kosher salt
- 3 teaspoons fresh lavender

#### Wet

- 1/4 cup pure maple syrup
- zest of 1 medium lemon
- juice of 1 medium lemon
- 1 large egg
- 1/4 cup extra virgin olive oil
- 1/4 cup plain Greek yogurt
- 1/2 cup grated zucchini



Source: Poet in the Pantry

### Recipe:

1. Preheat oven to 375 degrees Fahrenheit.
2. Line 6 cups of a muffin tin with paper liners and set aside.
3. Whisk together the dry ingredients in a large bowl. Set aside.
4. In another large bowl, beat the wet ingredients (except the zucchini) until well incorporated. Set aside.
5. Pour the dry ingredients into the wet. Add the zucchini and stir until just incorporated.
6. Using a large cookie scoop, portion out the dough evenly among the muffin cups.
7. Place tin in preheated oven and drop the temperature to 350 degrees Fahrenheit. Bake for 15-18 minutes, or until lightly browned. Cool on a wire rack

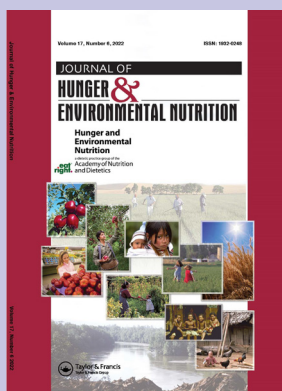
### Nutrition Facts

Amount Per Serving	% Daily Value*
Calories	200.3 kcal 10 %
Total Fat	19.6 g 39 %
Saturated Fat	1.6 g 8 %
Trans Fat	0 g 0 %
Cholesterol	31.6 mg 11 %
Sodium	176.3 mg 7 %
Total Carbohydrate	23.4 g 8 %
Dietary Fiber	2.1 g 8 %
Sugars	9 g 9 %
Protein	4.7 g 9 %
Vitamin A	1 % + Vitamin C 9 %
Calcium	7 % + Iron 5 %

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