

Environmental Nutrition



Redefining Healthy Food in the Health Care Sector

ABSTRACT

Healthy food cannot be defined by nutritional quality alone. It is the end result of a food system that conserves and renews natural resources, advances social justice and animal welfare, builds community wealth, and fulfills the food and nutrition needs of all eaters now and into the future.

This paper presents scientific data supporting this environmental nutrition approach, which expands the definition of healthy food beyond measurable food components such as calories, vitamins, and fats, to include the public health impacts of social, economic, and environmental factors related to the entire food system.

Adopting this broader understanding of what is needed to make healthy food shifts our focus from personal responsibility for eating a healthy diet to our collective social responsibility for creating a healthy, sustainable food system. We examine two important nutrition issues, obesity and meat consumption, to illustrate why the production of food is equally as important to consider in conversations about nutrition as the consumption of food.

The health care sector has the opportunity to harness its expertise and purchasing power to put an environmental nutrition approach into action and to make food a fundamental part of prevention-based health care.

I. Using an Environmental Nutrition Approach to Define Healthy Food

The health care sector increasingly recognizes that nutrition plays a significant role in health maintenance and disease prevention. Yet, analysis of nutrition-related issues continues to focus on a reductionist approach to health. Under the traditional nutrition model, “healthy food” is defined by measurable food components such as calories, vitamins, and fats, and health interventions are typically aimed at individuals.^{1,2} This paper argues for a much broader consideration of nutrition and how it intersects with the health of individuals, communities, and the ecosystems that sustain us. Considering nutrition as the ability to nourish ourselves and to promote health, we argue that how food is produced, processed, and distributed also matters in our assessment of what counts as healthy food. We begin from the assertion that healthy food is not only defined by the quantity and quality of the food we eat,

but that it must come from a food system that conserves and renews natural resources, advances social justice and animal welfare, builds community wealth, and fulfills the food and nutrition needs of all eaters now and into the future.¹

This definition of healthy food can be understood as an *environmental nutrition* approach. Environmental nutrition examines the public health impacts of social, economic, and environmental factors related to the entire food system. Traditional nutrition, on the other hand, is defined simply as “the intake of food, considered in relation to the body’s dietary needs.”³

Environmental nutrition encompasses both the direct impacts of the contemporary U.S. diet on human health as well as indirect health impacts associated with the conventional, industrial food system. Widely held consensus among medical and public health professionals finds that today’s typical U.S. diet contributes to a range of costly health problems, including obesity, diabetes, cardiovascular disease, cognitive decline and dementia, other neurodegenerative disorders, and various kinds of cancer.^{4,5,6,7} Meanwhile, the conventional food system

i The environmental nutrition framework of the Healthy Food in Health Care program is aligned with this definition developed by the Hunger and Environmental Nutrition Dietetic Practice Group of the Academy of Nutrition and Dietetics. <http://www.HENdpg.com>

threatens our health and overall well-being with increased air and water pollution, toxic chemical exposures, antibiotic-resistant bacteria, soil erosion, climate change from greenhouse gas emissions, and loss of biodiversity.^{8, 9, 10} Environmental nutrition, therefore, is a useful tool for critically analyzing the wide-reaching environmental, social, and health impacts of industrial agriculture. [Table 1]

Without the comprehensive lens of environmental nutrition, crucial aspects of the interconnections between food and health fall outside of our range of vision. For example, a traditional nutrition approach extols the benefits of eating more fish for Omega-3 fatty acids even as fisheries across the globe are collapsing due to unsustainable fishing rates and practices.¹¹ As our ability to continue producing food is threatened by the common practices and policies of our global, industrial food system, recommendations for a balanced diet become a moot point.

An environmental nutrition approach shifts our focus from personal responsibility for eating a healthy diet to our collective social responsibility for creating a healthy, sustainable food system.

While a traditional nutrition approach asks how much Vitamin C and other nutrients an apple contains, environmental nutrition guides us to also ask whether the apple was grown with toxic pesticides, whether the workers who grew it were treated justly, and which communities had access to purchasing it. From this perspective, not all apples are created equal – a given apple’s path from farm to plate can result in greater or lesser health, social, and environmental benefits. To rework a familiar saying, we might ask *which* apple a day is more likely to “keep the doctor away.” [Figure 1]

Finally, an environmental nutrition approach shifts our focus from personal responsibility for eating a healthy diet to our collective social responsibility for creating a healthy, sustainable food system. The individual exhorted to eat broccoli and blueberries for cancer-fighting antioxidants under a traditional nutrition model is seen from an environmental nutrition perspective as just one tiny node in a complex food system that is shaped primarily by public policy, agribusiness practices, and cultural values. Although an individual can commit to eating a healthy diet, one person cannot control systemic material flows that govern the relationship between food, health, and the environment, such as widespread use of pesticides and toxics that trespass into our bodies, ongoing soil erosion that degrades agricultural land, and the emission of greenhouse gases from agricultural activities that contribute to climate change.

In shifting from an individualistic to a systemic perspective, this approach highlights that those bodies at greatest risk of suffering health problems related to food production, processing, distribution, and consumption have the least power to change the food system, including agricultural workers, rural communities, and low income communities of color.^{12, 13, 14, 15}

Health care institutions have an important role to play in creating a healthier food system due to their substantial foodservice budgets, their role as trusted authorities on health issues, and their mission-driven interest in preserving wellness. As the American Medical Association asserts, “Hospitals should become both models and advocates of healthy, sustainable food systems that promote wellness and that ‘first, do no harm.’”¹⁶ This paper concludes with a set of recommendations to help health professionals and the institutions where they work make food a fundamental part of prevention-based health care.

Table 1: Exploring the Health Costs of the Industrial Food System

A 2012 workshop sponsored by the national Institute of Medicine (IOM) identified a wide range of potential adverse health impacts resulting from food production, processing, and marketing, including:

- Illnesses from food-borne pathogens;
- Ill-effects from exposure to chemicals (e.g., drug residues, hormones, pesticides, and other environmental toxicants);
- Antibiotic resistance from excessive, non-targeted overuse of antibiotics in animal agricultural production;
- Diet-related chronic disease (e.g., diabetes, cardiovascular disease, and cancer);
- Occupational injuries and disease associated with agricultural production and food processing;
- Adverse health effects associated with transportation (e.g., motor vehicle crashes and the effects of air pollution);
- Effects of exposure to air and water pollution from production practices (e.g., pesticide drift, manure-related ammonia emissions, and polluted surface water);
- Mental health impacts (e.g., mental stress associated with living or working near confined animal feeding operations [CAFOs] or with living and working conditions among migrant laborers); and
- Social impacts (e.g., effects of CAFOs on the independence of rural communities, rural development, and the ability to conduct social or leisure activities).

Source: IOM. 2012. *Exploring Health and Environmental Costs of Food – Workshop Summary*. Washington DC. National Academies Press.

Figure 1: Not All Apples Are Created Equal

Environmental Nutrition Redefines What Constitutes Healthy Food

TRADITIONAL NUTRITION

Focuses on biochemical components of food and individual food consumption

Asks:

How much Vitamin C?

How many calories?

How much fiber?



ENVIRONMENTAL NUTRITION

Accounts for social, political, economic, and environmental factors related to the food system as a whole

Also asks:

Was it grown with harmful pesticides or synthetic fertilizers?

What labor standards were used?

Were toxic chemicals used in packaging?

II. The Environmental Footprint of Industrial Food Production

Human well-being depends on healthy, resilient ecosystems to nourish and sustain all life. Water pollution, air contamination, soil erosion, climate change, and many other forms of ecosystem degradation resulting from human activity impact the health of individuals and communities. The United Nation's Millennium Ecosystem Assessment recently warned "human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted."¹⁷ Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history.¹⁸

Conventional agricultural techniques, modeled on an industrial mode of production and reliant on extensive fuel and chemical inputs and mono-cropping,¹⁹ are among the major drivers of the environmental change witnessed over the past five decades. Although there have been gains in human well-being resulting from modern food systems, these gains have been achieved at growing costs in the form of the degradation of many ecosystem services and the exacerbation of poverty for some groups of people.

By contributing to environmental degradation, industrial agricultural practices undermine the ecological basis of our survival and our ability to continue to produce food.²⁰ Increasing water scarcity, climate instability, and continued dependence on high inputs of energy, fertilizers, and pesticides challenge the viability of this industrial agricultural model in many regions, even in the near term.²¹ This section uses four examples to demonstrate this boomerang effect of industrial agriculture: greenhouse gas emissions, energy consumption, use of synthetic fertilizers, and water use.

Greenhouse Gas Emissions

The global food system accounts for approximately one third of all climate change-related greenhouse gas emissions (GHG) through land use change and direct emissions.²² In developed countries, the agricultural sector contributes an estimated 15 to 30 percent of total GHG emissions.²³ Within the food sector, animal agriculture contributes about 18 percent of total global GHG emissions according to the United Nations Food and Agriculture Organization (FAO).²⁴ This estimate includes both direct agriculture and forestry/land management related contributions. Within the United States, the agriculture sector is estimated to contribute 6.4 percent of total greenhouse gas emissions, the majority coming from industrial livestock operations.²⁵ A changing climate resulting from increased GHGs in the atmosphere could lead to unpredictable rain patterns, periods of dry spells, and other variable weather conditions that could negatively impact crop yields and the supply of food.²⁶

Energy Consumption

All stages of the food system life cycle use commercial energy with health-related consequences. Food production, processing, packaging, and distribution are the most energy-intensive stages. These stages rely on fossil fuels for their energy. Fossil fuel extraction, production, combustion, and consumption for the food system releases air and water pollutants that increase the risk of asthma, bronchitis, cardiovascular mortality, cognitive decline, and low birth weight babies.^{27, 28, 29, 30} In the United States, use of energy along the food chain for food purchases by or for U.S. households increased between 1997 and 2002 at more than six times the rate of increase in total domestic energy use.³¹

Synthetic Fertilizers

The three primary macronutrients that plants need to grow – nitrogen, phosphorus, and potassium – are the main components of mined or chemically-synthesized fertilizers. Since 1960, synthetic crop fertilization practices have caused flows of biologically available nitrogen in terrestrial ecosystems to double and flows of phosphorus to triple.³² Humans produce more biologically-available nitrogen than all natural pathways combined, and this may grow a further 65 percent by 2050.³³ Nitrogen and phosphorus runoff from cropland and animal feeding operations are major contributors to water pollution, resulting in algal blooms, oxygen depletion, and fish declines in streams, rivers, ponds, lakes, and marine ecosystems.³⁴ The depletion of global sources of phosphorus and potassium is cause for concern, as these nutrients cannot be synthesized, they must be mined. According to some analysts, we must dramatically reduce use of phosphorus, or we will face severe food shortages.³⁵

Water Use

Increasing water scarcity and exploitation undermine our ability to grow sufficient food now and into the future.³⁶ The agricultural sector is a major contributor to unsustainable and excessive water consumption.³⁷ Irrigation accounts for about a third of water use and is currently the largest use of fresh water in the United States.³⁸ Animal agriculture is one of the most water-intensive sectors in the food system. An analysis by the United Nations estimates that the livestock sector alone accounts for more than 8 percent of global water use, with the major portion going to irrigate feed crops for livestock (7 percent of the global usage).³⁹

III. The Role of Social Justice in Environmental Nutrition

The adverse health impacts associated with the industrialized food system are not evenly distributed: They disproportionately affect farm workers, rural communities, and low-income communities of color. Despite the abundance of food produced in the United States, food insecurity and malnutrition are serious public health issues. An environmental nutrition approach turns our attention to the interconnectedness of human health, social welfare, and environmental well-being.

Health Risks for Agricultural Workers and Rural Communities

Migrant and seasonal farm workers in the United States, who provide essential services for the production of many crops, are among the most economically disadvantaged people in our society. According to the 2007-2009 National Agricultural Worker Survey, 23 percent of farm worker families had total family income levels below the national poverty guidelines.⁴⁰

Agricultural workers also face a much greater risk of suffering pesticide-related illnesses than any other sector of society. U.S. farmers use hundreds of millions of pounds of active ingredients in pesticide formulations annually.⁴¹ Workers are exposed directly in fields, through pesticide drift in the air, and through take-home exposures on clothing. In addition to acute toxicity from pesticide poisoning, evidence continues to mount showing that certain agricultural pesticides increase the risk of cancer, birth defects, reproductive disorders, and neurodevelopmental disorders in farm workers, their children, and farming communities.^{42, 43, 44, 45, 46, 47, 48, 49} Children of farm workers are particularly vulnerable members of society. One of the most comprehensive longitudinal studies of this population shows that higher prenatal exposures to organophosphate pesticides are closely linked to reduced gestation time, decreased performance on tests of mental development at two years of age, and increased risk of attention deficit disorder at age five.^{50, 51}

Slaughterhouse workers also suffer high rates of occupational illness, including bacterial and viral infections, respiratory problems, and physical injury, and CAFO workers face increased health risks such as respiratory problems and exposure to antibiotic-resistant bacteria.^{52, 53, 54} Communities adjacent to CAFOs experience noxious odors and water pollution.^{55, 56} Confined animal feeding operations are also disproportionately located in communities with larger numbers of people of color.^{57, 58}

Despite the rise of conventional agriculture, food insecurity – the lack of consistent access to enough food to support active, healthy living – remains a major problem in the United States.

Food Insecurity and Food Deserts

During the past several decades, Americans' share of disposable personal income spent on food has decreased, from about 24 percent in 1930 to about 9.5 percent in 2010.⁵⁹ However, the relative reduction in food costs has not been evenly distributed. People living in poverty spend a higher percentage of their income on food.⁶⁰ Furthermore, commodity subsidies and certain crop insurance programs have helped to create an uneven playing field, making energy-dense, nutrient-poor food cheaper and more readily available.⁶¹

Despite the rise of conventional agriculture, food insecurity – the lack of consistent access to enough food to support active, healthy living – remains a major problem in the United States. In fact, food insecurity in the United States is higher than the global average.⁶² According to the U.S. Department of Agriculture (USDA), more than one million children are

hungry on a regular basis.⁶³ In 2010, 17.2 million U.S. households, including 43 percent of those below the poverty line, were food insecure.⁶⁴ Additionally, the United States is pockmarked with food deserts, regions where there is limited access to supermarkets and other outlets to purchase healthy and sustainable food. USDA data shows that, 23.5 million people live in food deserts across the country, over half of which are low-income.⁶⁵

Farm Debt and Consolidation

As agriculture has become more industrialized over the past century, farmers have taken on more debt and financial risk for capital expenditures. For example, total farm real estate debt is currently \$186.7 billion.⁶⁶ Smaller farmers have been increasingly pushed out of agriculture. The number of farms and the percentage of people employed on them have both decreased as a result of mechanization and the ongoing consolidation of farmland.⁶⁷ These trends have concentrated the power over the production of food with fewer and fewer corporate entities, contributing to the economic and social disintegration of rural communities. Many producers have accepted lower incomes and insecure farming contracts to remain competitive in the agricultural sector, and have turned away from more environmentally-friendly farming practices in favor of input-intensive ones, leading to biodiversity loss, air and water pollution, the overuse of pharmaceuticals, and animal and worker mishandling.^{68, 69}

A Movement Towards Environmental Nutrition

Scholars and public health advocates are increasingly utilizing an environmental nutrition framework for understanding the connections between the health of individuals, communities, and the environment. The following peer-reviewed articles and government reports are a sampling of studies that demonstrate the growing momentum around an environmental nutrition framing of food and health.

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IV. Rethinking Diet and Disease from an Environmental Nutrition Perspective

This section examines two common nutrition issues, obesity and meat consumption, to demonstrate how the assessment of social and environmental factors can give public health advocates a better understanding of the causes of contemporary health concerns and a more comprehensive analysis of pathways to create positive change.

1. Obesity: Beyond Counting Calories

Too often, recommendations for addressing the “obesity epidemic” focus on individual responsibility for improving eating and exercise habits.⁷⁰ An environmental nutrition approach, in contrast, understands obesity as a systemic problem with multi-level political, economic, social, and environmental drivers. It traces the impacts of a particular food back from the moment of consumption to include factors of production, processing, and marketing. Thus, the focus shifts from personal choice to social responsibility, including the role public policy and agribusiness play in shaping our food system.

The Increased Consumption of Calories and Sweeteners

A growing body of evidence demonstrates the connection between food-related diseases such as obesity and dietary trends in the United States, including increased consumption of calories particularly from refined carbohydrates and sweeteners.

On average, individuals in the United States consumed roughly 300 more calories per day in 2000 than in 1985.⁷¹ Of the extra calories added to the average American diet since 1985, 24 percent came from added fats, 23 percent from added sugars, and 46 percent from refined grains. Research links obesity promotion with the consumption of added fats, sugars, and refined grains which are prominent in snacks, sweets, beverages, and fast foods.^{72, 73}

One of the primary sweeteners consumed in the United States is high fructose corn syrup (HFCS), in part due to its low price compared to sugar.⁷⁴ Consumption of corn-sweetener calories has risen 359 percent to 246 calories per day since 1970.⁷⁵ Permeating the typical U.S. diet, HFCS is associated with increased risk of obesity, diabetes, and other diseases linked to refined sugars as a result of excessive consumption.^{76, 77, 78, 79}

Policy, Production, and Processing: The Case of High Fructose Corn Syrup

The increased intake of HFCS is a new phenomenon whose roots go beyond individual taste preferences. Scholars argue

that the prevalence of HFCS in staples such as bread, processed foods, drinks, and other food items is the result of the overproduction of corn in the United States in the twentieth century.⁸⁰ For decades, U.S. federal agricultural policies have favored commodity crops including corn.⁸¹ The resulting corn surplus incentivized the development of new products to absorb the excess, which contributed to the proliferation of HFCS in our food supply.⁸² Thus, changes in policy, production, processing, and marketing have increased the consumption of HFCS by individuals in the United States.⁸³

Further, data on corn production used to produce HFCS illustrate the interlinking human health and environmental concerns associated with the dominant food system that go beyond obesity and calories consumed. It is estimated that, in the 2000s, about 511 million bushels of corn, or about 4.7 percent of the total U.S. corn crop, has been used to produce HFCS.⁸⁴ Industrial corn production depends on large amounts of pesticides and synthetic fertilizers. One of the primary herbicides used in corn production, atrazine, is classified as a possible carcinogen and a known endocrine disruptor.⁸⁵ Over 80 million pounds of atrazine are used annually in the United States.⁸⁶ Studies show widespread atrazine contamination in watersheds and drinking water throughout the United States with highest levels in corn-producing areas in the Midwest.^{87, 88} Excess nutrient runoff from synthetic fertilizers used in corn production contributes to an approximately 8,500 square mile “dead zone” in the Gulf of Mexico depleted of the oxygen necessary to support marine life.⁸⁹ Meanwhile, elevated nitrates in drinking water in rural communities contribute to methemoglobinemia, or “blue baby syndrome,” characterized by a reduction in the oxygen-carrying capacity of blood.⁹⁰

This evidence demonstrates that a narrow focus on individual consumption of sugar-sweetened beverages may miss other public health impacts of unhealthy food production.

Emerging Evidence: Obesogens

Finally, a growing body of evidence from toxicological and epidemiological research demonstrates that exposure to certain synthetic chemicals, called obesogens, may alter the development of metabolic pathways and adipose tissue, resulting in obesity and insulin resistance.⁹¹ A number of these chemicals are food contaminants, either because they are used in food production and packaging, or because they are general environmental contaminants that enter the food chain.

Researchers have identified the sweetener fructose, a component of HFCS, as one possible obesogen.⁹² Among other chemicals identified are Bisphenol-A (BPA), phthalates, and perfluorinated compounds, which are commonly used in packaging and can migrate directly into food and beverages.⁹³ Epidemiologic research also show an increased risk of obesity associated with higher levels of exposure to polychlorinated biphenyls and certain organochlorine pesticides.⁹⁴ Organochlorine pesticides have largely been phased out of U.S. agricultural production yet they continue to contaminate our

food supply and our bodies because they are fat soluble, persistent, and bioaccumulative – in other words, years after they were banned from use in agriculture, they remain in our soil and water because they take years to break down.⁹⁵

The presence of these chemical compounds within the food system and the mounting evidence that they play a role in the obesity crisis further shifts our focus from individual behavior and eating habits to political, economic, and technological aspects of the food system. The National Institute of Environmental Health Sciences supports investigations on obesogenic chemicals as part of their strategic plan in obesity research.⁹⁶

2. Meat Consumption: An Environmental Nutrition Approach

Historical trends demonstrate a relatively steady increase in U.S. meat consumption since 1960.⁹⁷ A traditional nutrition approach promotes meat consumption as part of a healthy diet. For example, visuals developed by the USDA, such as the Food Pyramid and MyPlate, recommend daily servings of meat and other animal proteins, while the recent popularity of low-carb weight-loss diets like the Atkins or Paleo Diet, have moved meat products to the center of the plate. An environmental nutrition approach, in contrast, recognizes that the production and high consumption of meat is associated with many environmental, ethical, social, and health problems.

Air and Water Pollution from Confined Animal Feeding Operations

The raising of livestock in the United States has become increasingly dominated by CAFOs.⁹⁸ This is animal husbandry based on an industrial model focused on rapid growth and high output of animal products like meat, milk and eggs. Confined animal feeding operations produce large amounts of air and water pollution from animal waste, use huge amounts of water and land for feed production, contribute to the spread of human and animal diseases, and play a major role in climate change and biodiversity loss.⁹⁹ Manure lagoons at CAFOs leach pollutants including phosphorus, heavy metals and ammonia into waterways and create noxious, asthma-inducing odors.¹⁰⁰

Antibiotic Overuse in Animal Agriculture

According to government estimates, more than four times the amount of antibiotics are sold for use in animal agriculture – close to 30 million pounds – compared to human medicine in the United States. Antibiotics are routinely given to poultry, beef cattle, and swine to promote faster growth and to prevent disease outbreaks that are inevitable under confined, often unhygienic conditions. These are the same antibiotic classes used to treat human infections, including penicillins, tetracyclines, sulfa drugs, macrolides, and more.¹⁰¹

There is strong consensus among health experts that the practice poses a threat to human health by providing selective pressure for antibiotic-resistant bacteria.¹⁰² It is a position

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shared by the U.S. Institutes of Medicine, the U.S. Centers for Disease Control, the World Health Organization, and leading medical associations.^{103, 104, 105}

Antibiotic resistance increases the number of bacterial infections, increases the severity of those infections, and helps drive up hospital costs. In the United States, close to 19,000 deaths from methicillin-resistant *Staphylococcus aureus* (MRSA) occur on an annual basis. Longer, more expensive hospital stays for treating antibiotic resistant infections costs the health care sector \$21 billion to \$34 billion each year.¹⁰⁶

Meat Production and Climate Change

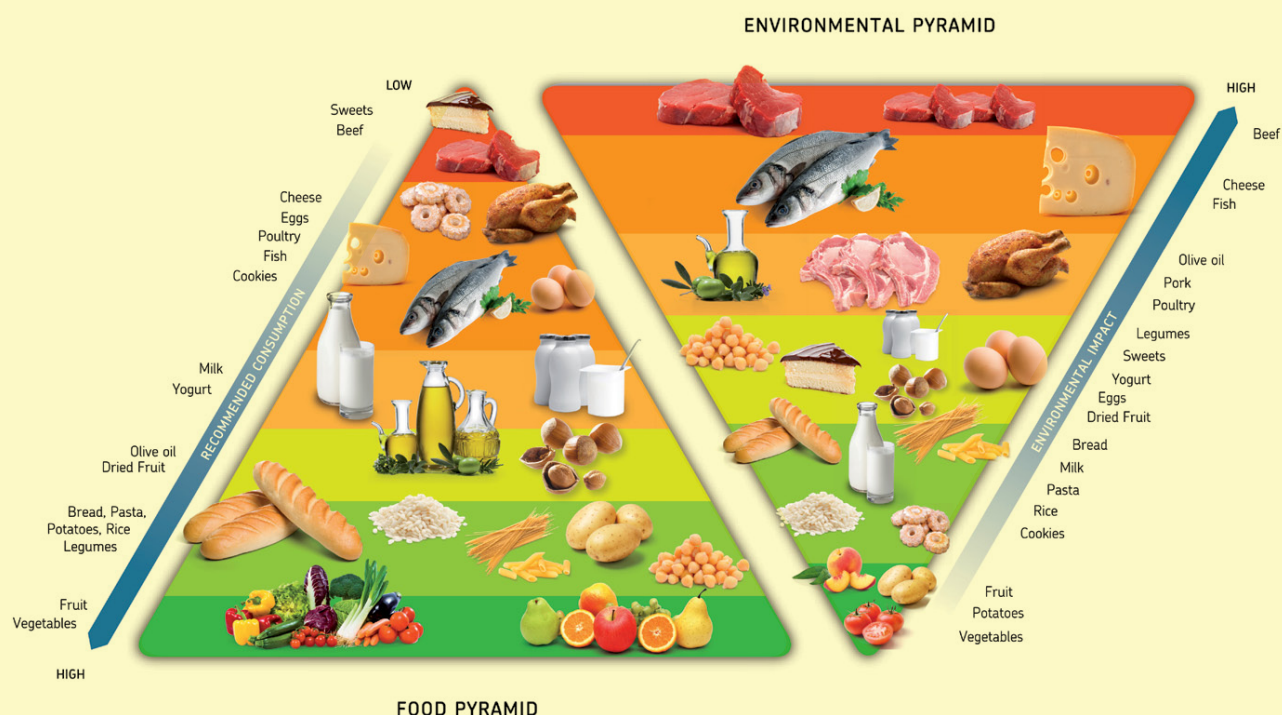
From beginning to end, the life cycle of industrial meat production results in the highest amount of greenhouse gas emissions of any food.¹⁰⁷ Globally, livestock production for meat and dairy accounts for 18 percent of the world's greenhouse gases.¹⁰⁸ In the United States, red meat production is particularly fossil fuel-intensive due to the use of pesticides and fertilizers to produce grain for animal feed and the need for transportation and refrigeration of meat products.^{109,110} Livestock also emit large quantities of methane, a greenhouse gas far more potent than carbon dioxide. According to the FAO, 39 percent of greenhouse gas emissions associated with livestock production are methane, most of which come from beef cattle.¹¹¹

High levels of meat production lead to boomerang health effects in terms of climate change. Researchers have described a range of human health impacts associated with climate change, including increased incidence of infectious disease as warming expands the range of disease vectors (e.g., mosquitoes, ticks, and fleas) into the United States; increased health problems associated with extreme and prolonged heat, such as heat cramps, fainting, exhaustion, and heatstroke; and worsened criteria air pollution (e.g., ground-level ozone), causing and worsening chronic respiratory and cardiovascular disease, damaging lung tissue, and causing premature death.¹¹²

Co-Benefits of Plant-Based Diets: What is Good For Us is Good For the Planet

There is evidence to suggest that diets that are healthy for us are also good for the environment and for animal welfare, demonstrating important common ground between traditional nutrition concerns and environmental nutrition issues.

Figure 2: Environmental Food Pyramid



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Plant-based diets and diets low in red meat consumption are associated with positive health outcomes and significantly less environmental degradation. High levels of processed meat and red meat consumption have been associated with increased risk of cardiovascular disease and certain kinds of cancer,^{113, 114, 115} while many studies suggest that there is a range of health benefits associated with a diet low in animal protein. A great deal of research on plant-based diets falls under the category of the “Mediterranean diet”. The Mediterranean diet features fruits and vegetables, legumes, nuts, whole grains, healthy fats and oils, moderate dairy and fish, lesser amounts of meat, and little or no refined sugars. This diet is generally associated with markedly improved health status when compared to the typical U.S. diet today.¹¹⁶ Diabetes, metabolic syndrome, cardiovascular disease, and various kinds of cancer are among a long list of diseases and disorders less likely in individuals and populations adhering to diets with these general features.^{117, 118, 119, 120, 121} Other evidence points to reversal of coronary artery disease and improved outcomes in men with prostate cancer associated with diets that are even more plant-based and lower in fats than the Mediterranean diet.^{122, 123, 124}

From an environmental nutrition perspective, shifts toward plant-based diets have the potential to dramatically reduce the size and scope of agriculture’s ecological and climate footprints. The Barilla Center for Food and Nutrition portrays this concept as a double pyramid.¹²⁵ [Figure 2]

Through a simplified representation of food consumption and environmental impacts, the double pyramid shows that plant-based diets result in substantially less environmental degradation than the typical American diet. For example, water consumption and greenhouse gas emissions are both reduced as red meat consumption is reduced.

V. Creating a Healthier, Sustainable Food System

It is evident that common practices of the modern, industrial food system underlie a range of significant health and environmental concerns. Along with producing a surfeit of food and beverages associated with health concerns, the conventional food system results in environmental impacts that contribute to the human disease burden and that degrade ecosystem functions on which all life depends. Furthermore, the natural resource conditions that enabled this system to develop, including abundant water and land resources and a stable climate, are rapidly changing. The food system requires re-imagining and re-structuring for long-term resilience.¹²⁶ With local and regional differences in water availability, climate, soil conditions, urban

development and other human activities, each of which is undergoing change, no single system will suit all circumstances, but certain general characteristics will contribute to resilience and sustainability. [Table 2]

Models for more sustainable production already exist. Evidence demonstrates that organic and agroecological methods can help mitigate climate change by sequestering carbon in soils through organic matter accumulation.¹²⁷ Research has demonstrated that organic farming methods can also contribute to greater biodiversity by providing wildlife and soil biota habitat, help to conserve soil and water resources, and reduce or eliminate the use of synthetic fertilizers and pesticides that wreak havoc in ecosystems.^{128, 129}

Table 2: A New Global Model for Agriculture

There is increasing recognition that we need a new model of agriculture in order to foster the health of natural and human communities around the world. In 2002, the World Bank and the FAO convened a global consultative process to determine how best to accomplish these goals. It was called the International Assessment of Agricultural Knowledge, Science and Technology for Development, and it resulted in the publication of *Agriculture at a Crossroads*.¹³⁰ The report argues that a sustainable food system should:

- Provide healthy food, fairly distributed, and accessible in the context of increasingly uncertain and changing environmental conditions;
- Avoid contributing to water scarcity, climate instability, soil and biodiversity loss;
- Avoid contributing to air and water pollution; and
- Reduce hunger, improve urban and rural livelihoods, and help to facilitate equitable environmentally, socially, and economically sustainable development.

Successfully meeting these goals will require a fundamental shift in agricultural science, technology, policies, institutions, capacity development, and investment. Such a shift would account for the complexity of agricultural systems within diverse social and ecological contexts and would recognize the multi-functionality of agriculture, meaning its potential to produce not only food, but also other public goods such as landscape management and livelihood protection when managed with those goals in mind.

As health care providers, we recognize the interdependence between human health and our environment and believe in the caring stewardship of a renewable Earth for the enhancement of all life. If it's good for the planet, it's good for the patient.
– Dignity Health

The Role of Hospitals and Health Professionals

Rather than continuing to treat the downstream symptoms of a broken food system, health care institutions can use an environmental nutrition approach to put food at the center of prevention-based care. From both an economic and ethical perspective, allocating resources to maintain sustainable public health for all people and ecosystems is imperative.¹³²

Given their sizeable food service budgets, health care institutions can play a major role in supporting sustainable farmers and transforming food supply chains. A single hospital may spend \$1 to \$7 million or more on food and beverages each year,¹³³ while the health care sector as a whole spends \$12 billion annually.¹³⁴

Health care institutions can also leverage another form of currency: the moral authority associated with health care credentials. Polls consistently show that health professionals rank as some of the most trusted professionals in the United States.¹³⁵ Health professionals can take action both within and beyond hospital walls. Every day, health care food service staff have an opportunity to model healthy, sustainable food choices for patients, employees, and visitors. Signage, special events, and clinician visits can be used to educate a broad audience about the interconnections between food, health, and the environment.

In the larger community, health professionals can be particularly strong advocates for public policies on environmental nutrition issues. Through policy engagement, health professionals can help create the conditions for a food system that guarantees environmental stewardship, maintenance of local economies, animal welfare, and protection of public health for all citizens, now and into the future.

Taking Action on Environmental Nutrition

EDUCATION

Clinicians can organize Grand Rounds at their facilities focused on an environmental nutrition issue like antibiotics overuse in food animal production to raise awareness among their colleagues about the health impacts of industrialized agriculture.

HOSPITAL FOOD PURCHASING

Food service staff can procure sustainably produced foods and beverages and support farmers, distributors, and food businesses that are actively building a healthier food system.

PUBLIC POLICY

Health professionals can leverage their health expertise and visit elected officials to advocate for public policies that promote sustainable and fair agricultural production practices.

RESEARCH

Health professionals and scientists can support and promote ongoing research on the individual and community health impacts of our current food production methods with an emphasis on agricultural inputs such as pesticides, fertilizers, fossil fuels, antibiotics, and genetically modified organisms.

HEALTH CARE WITHOUT HARM'S HEALTHY FOOD IN HEALTH CARE PROGRAM

Health Care Without Harm's Healthy Food in Health Care program harnesses the expertise and purchasing power of the health care sector to put an environmental nutrition approach into action. Visit Health Care Without Harm's Healthy Food in Health Care website to access purchasing resources, download educational tools, sign up for our electronic mailing list, and to learn more: www.healthyfoodinhealthcare.com

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ACRONYMS

BPA	Bisphenol-A
CAFO	Confined Animal Feeding Operation
CLA	Conjugated Linoleic Acid
EPA	Environmental Protection Agency (United States)
FAO	Food and Agriculture Organization (United Nations)
GHG	Greenhouse Gases
HFCS	High Fructose Corn Syrup
HFHC	Healthy Food in Health Care
HCWH	Health Care Without Harm
IOM	Institute of Medicine
MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i>
USDA	United States Department of Agriculture

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