Food is Medicine:

A Food-First Approach

Olivia Myers, RDN, LD

Disclosures

Member of Food is Medicine SC, sponsor of this presentation.

Founder, Director of GroceryRx- a produce prescription program by Lowcountry Street Grocery.

Objectives

#1

Define Food Is Medicine and explore program types

#2

Review a brief history of the U.S. food system and nutrition implications of our modern food system

#3

Explore how agricultural practices impact nutrient density in food

#4

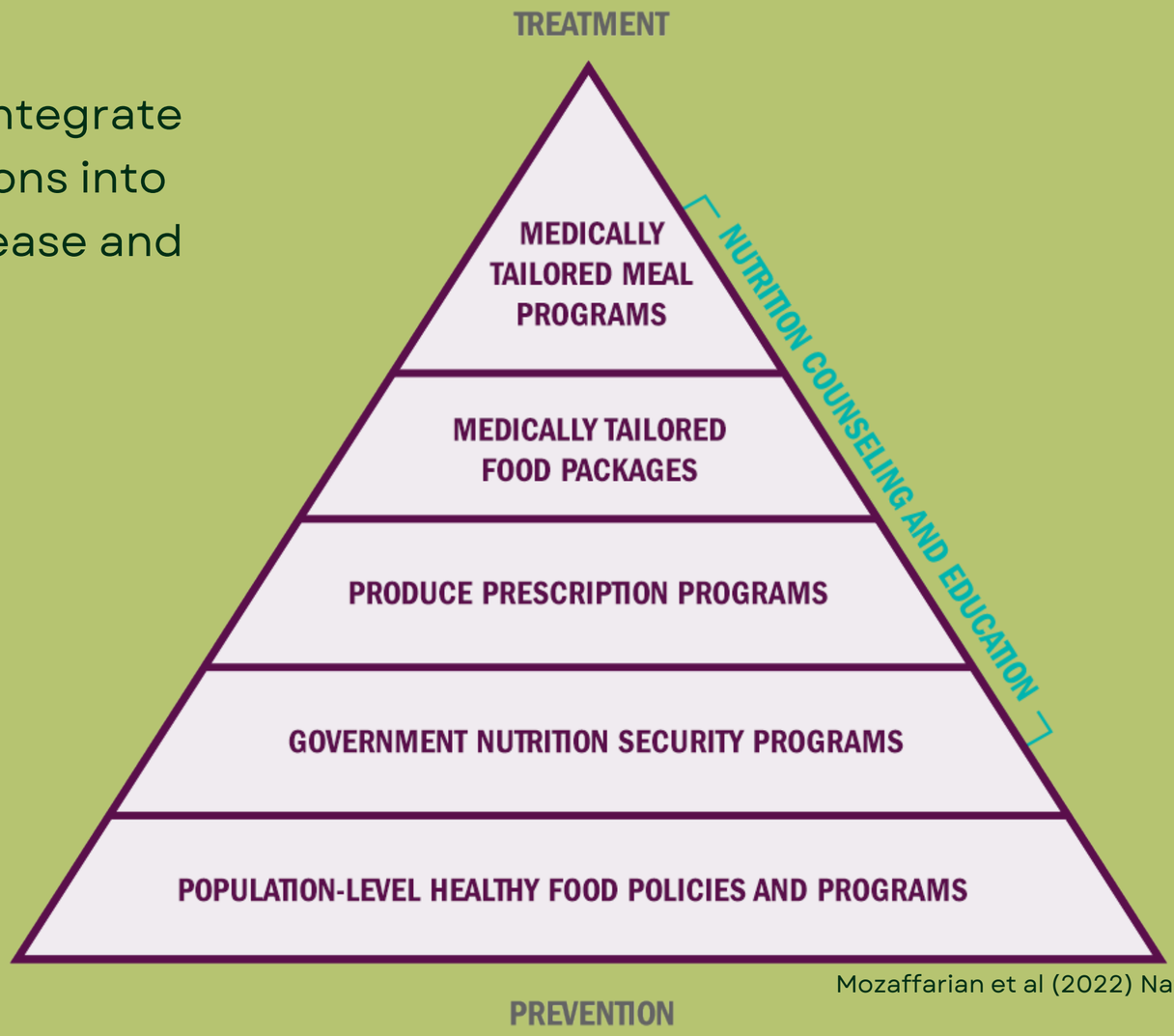
Understand the relationship of food, agriculture and health and why it is relevant to the work of dietitians and other healthcare professionals

What is Food is Medicine and Why Is It Getting So Much Attention?

What is Food Is Medicine?

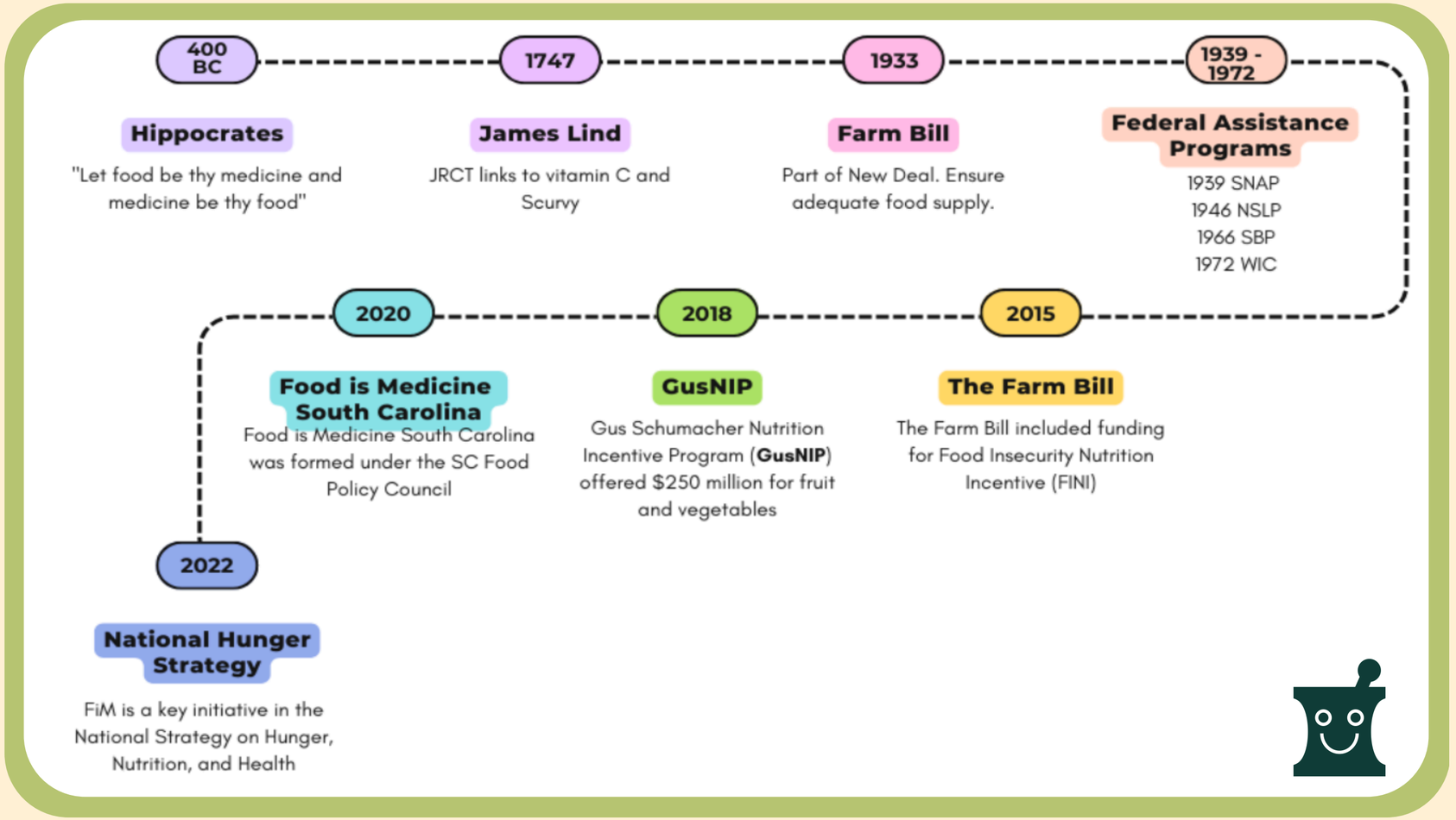
Food is Medicine (FIM) programs integrate food-based nutritional interventions into healthcare to treat or prevent disease and advance health equity.

Mozaffarian et al (2024) J Am Coll Cardiol



Mozaffarian et al (2022) Nat Med.

Food Is Medicine



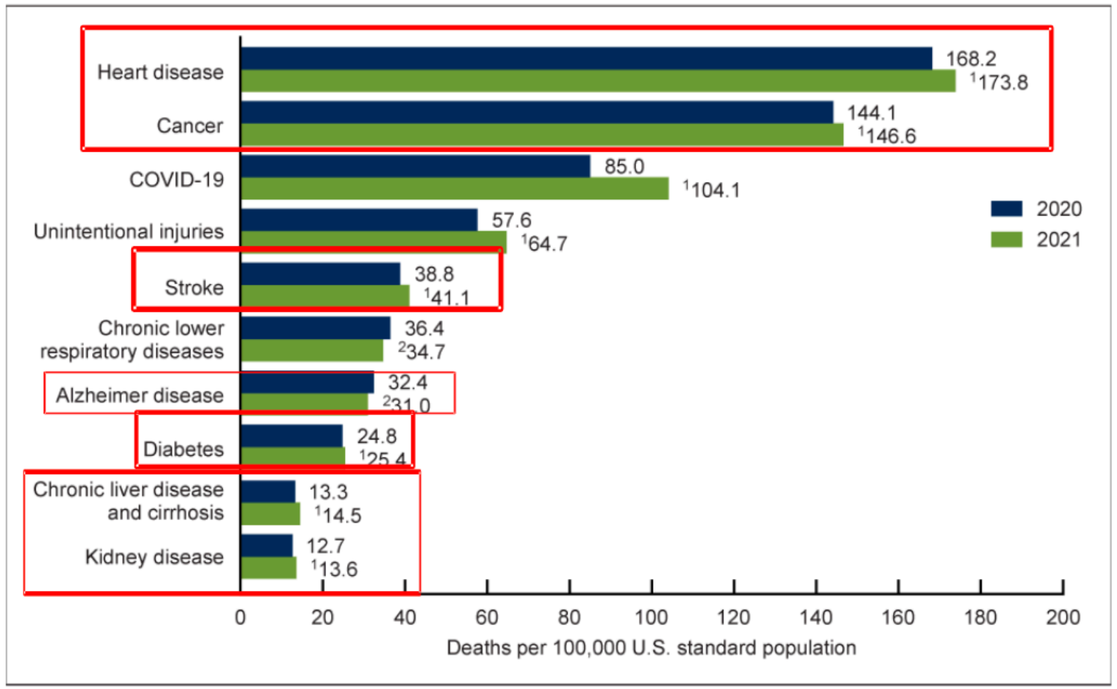
(Carpenter, 2012), (Moran, 2023) (Taylor, 1985)

Why is Food is Medicine “In” Right Now?

- Healthcare spending is higher than ever, but people are also sicker than ever.
- Chronic disease continues as the predominant cause of morbidity and mortality worldwide.
- Studies are showing improved diabetes outcomes, improved mental health, better medication adherence and weight loss for individuals enrolled in FIM programs, like MTM.
- There is growing evidence of significant real and potential financial savings by employing FIM programs.

Leading Causes of Death in the U.S.

Figure 4. Age-adjusted death rate for the 10 leading causes of death in 2021: United States, 2020 and 2021



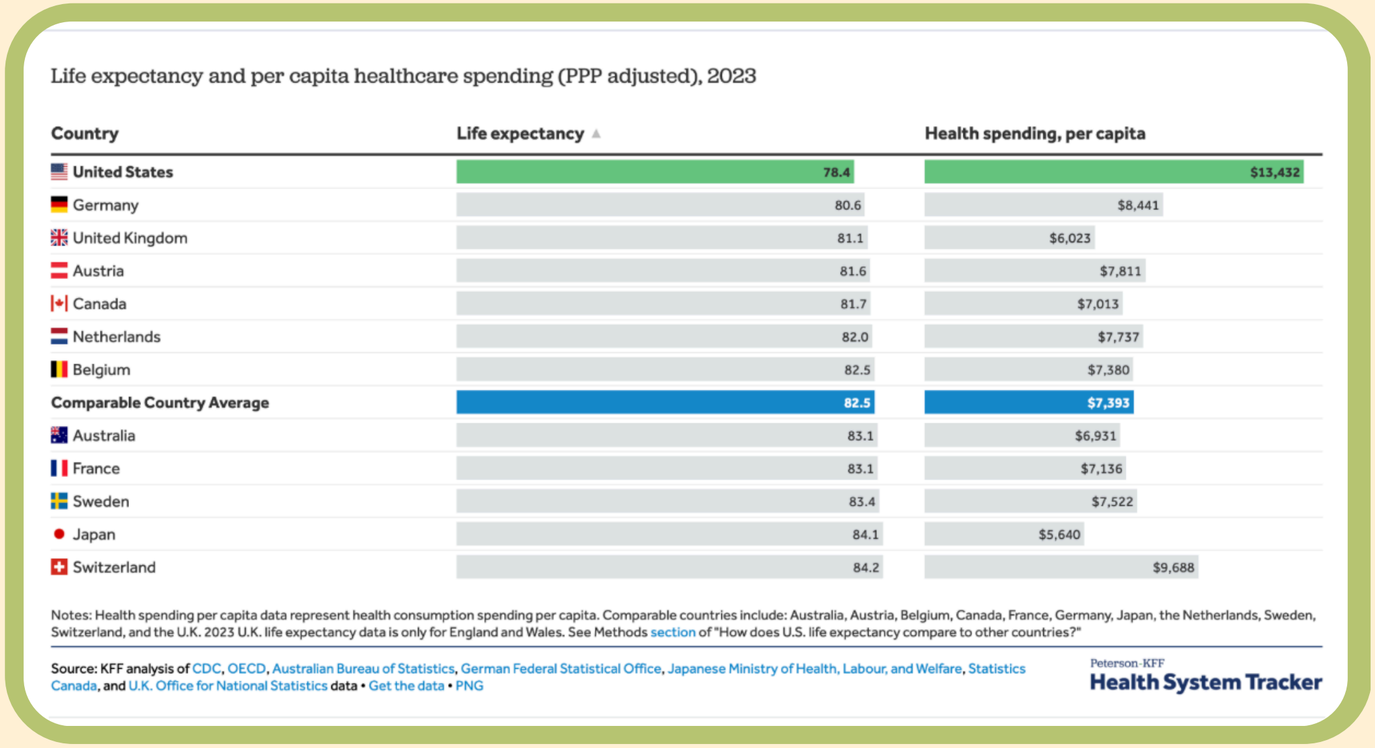
[1]Statistically significant increase from 2020 to 2021 ($p < 0.05$).
[2]Statistically significant decrease from 2020 to 2021 ($p < 0.05$).
NOTES: A total of 3,464,231 resident deaths were registered in the United States in 2021. The 10 leading causes of death accounted for 74.5% of all U.S. deaths in 2021. Causes of death are ranked according to number of deaths. Rankings for 2020 data are not shown. Data table for Figure 4 includes the number of deaths for leading causes and the percentage of total deaths. Access data table for Figure 4 at: https://www.cdc.gov/nchs/data/databriefs/db456-tables.pdf#4.
SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

- 60% of Americans have 1 chronic disease, and 40% have 2 or more
- Chronic diseases account for a majority of the leading causes of death in the US, many of which are diet-related
- ~90% of US healthcare costs go towards treating chronic disease (~$4 trillion total)

(Murphy, 2020, NCHS Data Brief)

DYK?

The U.S. has the lowest life expectancy among G7 countries while outspending its peers on healthcare.



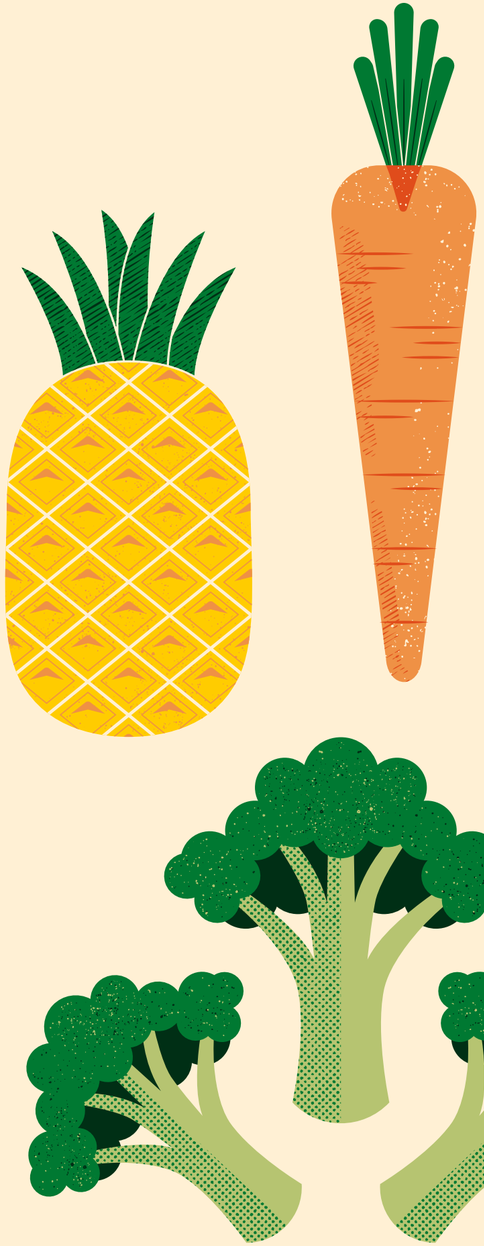
Life expectancy and per capita healthcare spending (PPP adjusted), 2023

Country	Life expectancy	Health spending, per capita
United States	**78.4**	**$13,432**
Germany	80.6	$8,441
United Kingdom	81.1	$6,023
Austria	81.6	$7,811
Canada	81.7	$7,013
Netherlands	82.0	$7,737
Belgium	82.5	$7,380
Comparable Country Average	**82.5**	**$7,393**
Australia	83.1	$6,931
France	83.1	$7,136
Sweden	83.4	$7,522
Japan	84.1	$5,640
Switzerland	84.2	$9,688

Notes: Health spending per capita data represent health consumption spending per capita. Comparable countries include: Australia, Austria, Belgium, Canada, France, Germany, Japan, the Netherlands, Sweden, Switzerland, and the U.K. 2023 U.K. life expectancy data is only for England and Wales. See Methods section of "How does U.S. life expectancy compare to other countries?"

Source: KFF analysis of CDC, OECD, Australian Bureau of Statistics, German Federal Statistical Office, Japanese Ministry of Health, Labour, and Welfare, Statistics Canada, and U.K. Office for National Statistics data • Get the data • PNG

Peterson-KFF Health System Tracker



Personal health spending has increased in the last five decades from $353 per year in 1970 (or $2770.37 when adjusted for inflation) to $14,570 per year in 2023. (NHEA)

FIM Can Reduce Healthcare Costs AND Improve Quality of Life!

CASE STUDY 1

Medically Tailored Meals: Hospitalizations & Health Care Expenditures

6.3 MILLION ELIGIBLE RECIPIENTS
with complex chronic disease plus limited instrumental activities of daily living

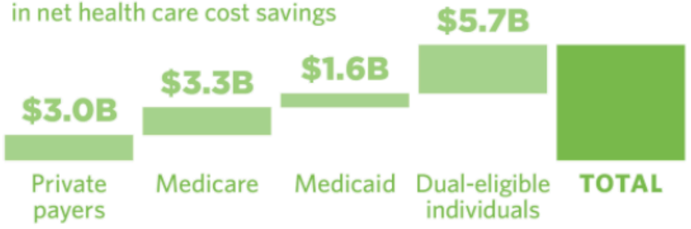
In one year of national MTM coverage:

1.6 Million fewer hospitalizations

$24.8 Billion in program costs

$38.7 Billion in health care cost savings

$13.6 Billion
in net health care cost savings



CASE STUDY 2

Produce Prescription Programs: Health & Economic Impacts

6.5 MILLION ELIGIBLE RECIPIENTS
with diabetes plus food insecurity

Over a lifetime:

292,000 CVD events prevented

260,000 QALYs generated

$44.3 Billion in program costs

$39.6 Billion in health care cost savings

$4.8 Billion in productivity savings

Highly cost-effective from a health care perspective (**$18,100/QALY**), cost-saving from societal perspective.

(Mozaffarian et al, J Am Coll Cardiol, 2024)

PRODUCE -PRESCRIPTION PROGRAMS

Systematic Review, 13 US programs

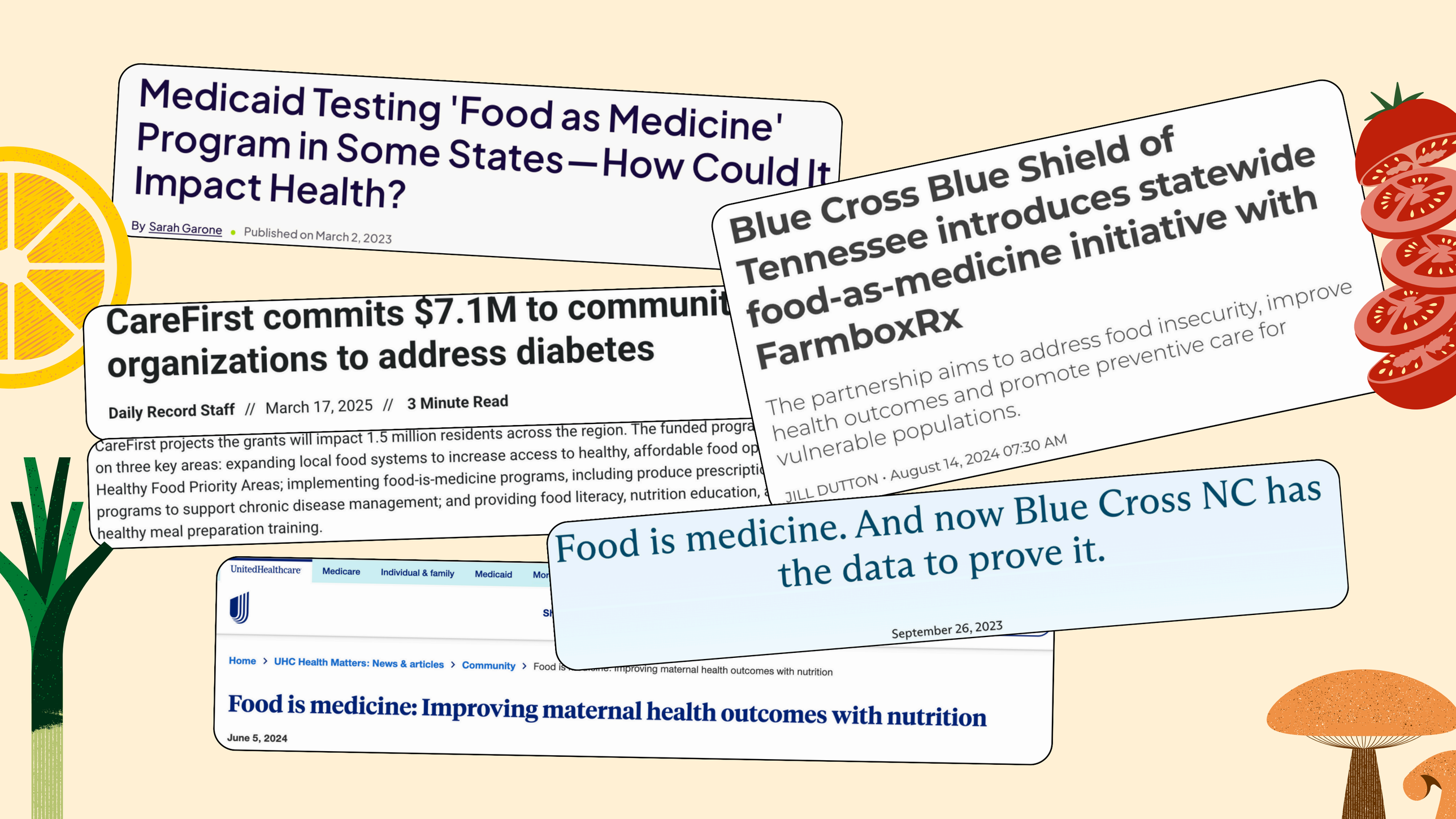
- Increased fruit and vegetable consumption by 0.8 servings per day.
- Decreased body mass index (BMI) by 0.6 kg/m2
- Among patients with diabetes, decreased hemoglobin A1c (HbA1c) by 0.8 points.

Bhat, Adv Nutr, 2021)

MEDICALLY-TAILORED MEALS

- Evidence for use in patients with advanced disease
  - Better disease management
  - Fewer hospitalizations (up to 52% lower risk)
  - Fewer emergency department visits
  - Lower healthcare expenditures (up to 31% monthly reduction, $2,500 yearly savings after paying meal costs)

(Hager, JAMA, 2022)


Medicaid Testing 'Food as Medicine' Program in Some States—How Could It Impact Health?
By Sarah Garone • Published on March 2, 2023
CareFirst commits $7.1M to communit organizations to address diabetes
Daily Record Staff // March 17, 2025 // 3 Minute Read
CareFirst projects the grants will impact 1.5 million residents across the region. The funded progra
on three key areas: expanding local food systems to increase access to healthy, affordable food op
Healthy Food Priority Areas; implementing food-is-medicine programs, including produce prescriptio
programs to support chronic disease management; and providing food literacy, nutrition education, a
healthy meal preparation training.
Blue Cross Blue Shield of Tennessee introduces statewide food-as-medicine initiative with FarmboxRx
The partnership aims to address food insecurity, improve health outcomes and promote preventive care for vulnerable populations.
JILL DUTTON · August 14, 2024 07:30 AM
Food is medicine. And now Blue Cross NC has the data to prove it.
September 26, 2023
UnitedHealthcare
Medicare
Individual & family
Medicaid
Home › UHC Health Matters: News & articles › Community › Food is medicine: Improving maternal health outcomes with nutrition
Food is medicine: Improving maternal health outcomes with nutrition
June 5, 2024

When Did Food Become *NOT* Medicine? Or worse, the Illness.

A (Very) Brief History of the Modern U.S. Food System

The early part of the 20th century saw radical, unsustainable shifts that were intended to bolster food security. However, these centralized efforts proved disastrous to the environment and health of future generations.

1917: World War 1

Farmers were encouraged to over-farm submarginal land to meet the needs of the war. This required them to clear and plow land, leaving it exposed and open to severe soil erosion.

Early 1920's: Agriculture Expansion

New technologies and crop varieties allowed for farmers to grow on more acres more efficiently.

1929: The Great Depression

As prices plummeted, farmers had to grow more aggressively to make enough money. They did not have money for soil rehab and conservation. Poverty and hunger skyrocketed.

...A (Very) Brief History of the U.S. Food System

1931: The Dust Bowl

Severe drought, strong winds and years of poor farming practices caused the ecological disaster.

1933: The Farm Bill

Introduced to bring economic relief from the Great Depression and the Dust Bowl, by “keeping food prices fair, ensuring an adequate food supply, and protecting natural resources”.

Introduced federal subsidies to support farms

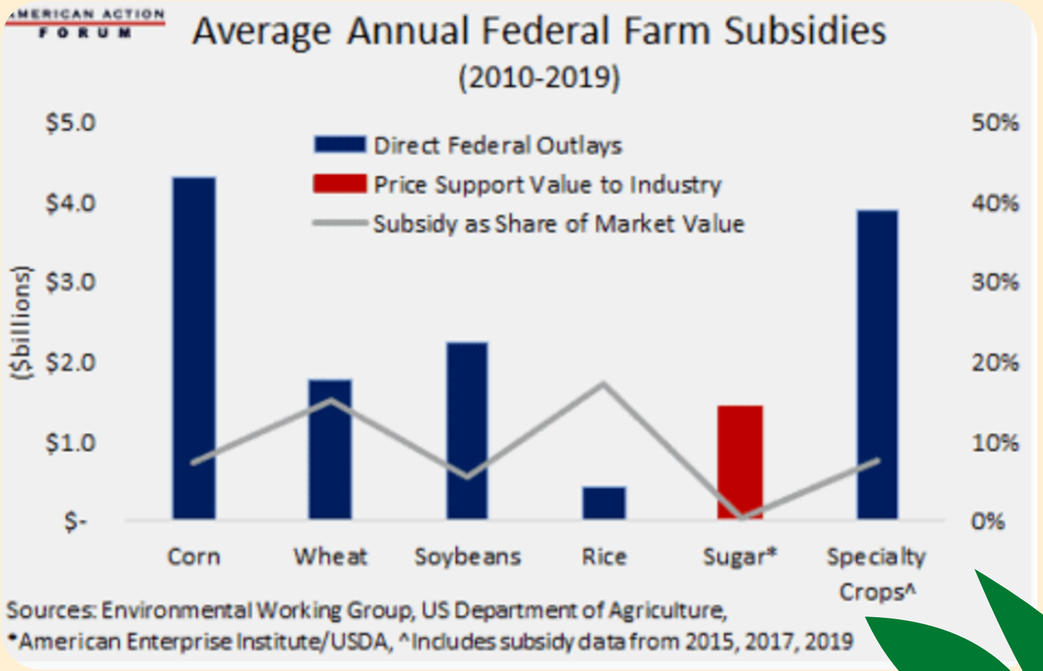
1960’s (U.S.): The Green Revolution

- High-yield crop varieties
- Synthetic fertilizers: N, P, K - reduce the need for land rest
- Chemical pesticides
- Dramatic increase in food production -> decreased malnutrition and hunger worldwide
- The few could feed the many
- “Bigger is better!”
- The U.S. transitioned to a more centralized food system

U.S. Food System Today

- **6.8 m farms in 1935 → 1.88 m farms in 2024**
- Agricultural subsidies
  - ~$30 billion per year
  - The “Big Five”: corn, soybeans, wheat, cotton and rice (USDA, 2025)
  - Sugar, dairy, livestock and oilseeds are also heavily subsidized
  - Use 61% (235 million) acres of total U.S. cropland
  - Majority used for animal feed, biofuel and industry
  - <1% of corn grown is sweet corn
  - The portion that goes to human consumption is largely through ultra-processed foods

(Giri, USDA, 2021)



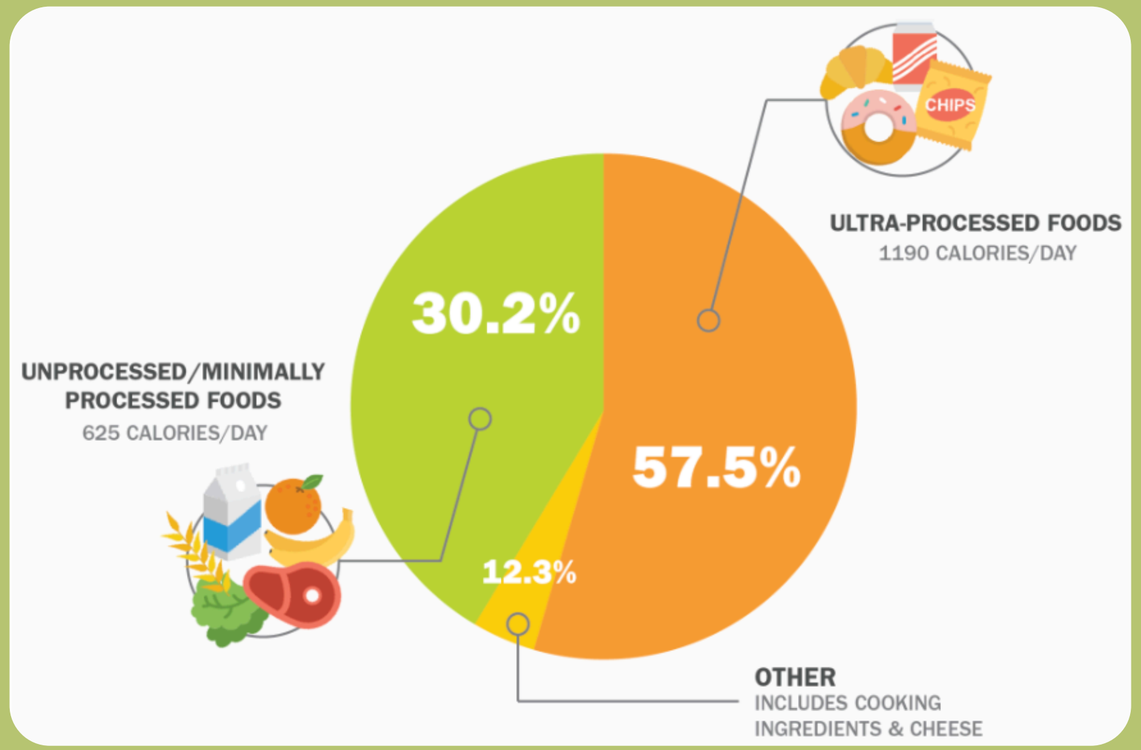
U.S. Food System Today

- Only 1.5% of cropland is used to grow fruits and vegetables
- The U.S. is now importing more agricultural goods than it is exporting, in large part driven by the demand for year-round produce
- **Food Miles** is the distance food travels from the location where it is grown to the location where it is consumed.
  - Processed food >1,300 miles
  - Fresh Produce >1,500 miles
- The time from harvest to market averages 2-7 days when grown within the U.S. and anywhere from 10-30 days when imported.

(Hill, Attra, 2008)

Dietary Trends

- >50% of calories consumed in the American diet is from Ultra-Processed foods
- Americans are not meeting DGA's
- Dietary micronutrient inadequacies in the U.S.
  - Vitamin A: 45%
  - Vitamin C: 46%
  - Vitamin D: 95%
  - Vitamin E: 84%
  - Zinc: 15%
  - Smaller inadequacies in folate, iron, and vitamin B6
- Dietary supplements are a growing industry, ~$54 billion in annual sales - yikes!



Wolfson, Journal of Nutr, 2025
Reider, Nutrients, 2020

Dietary Intakes Compared to Recommendations

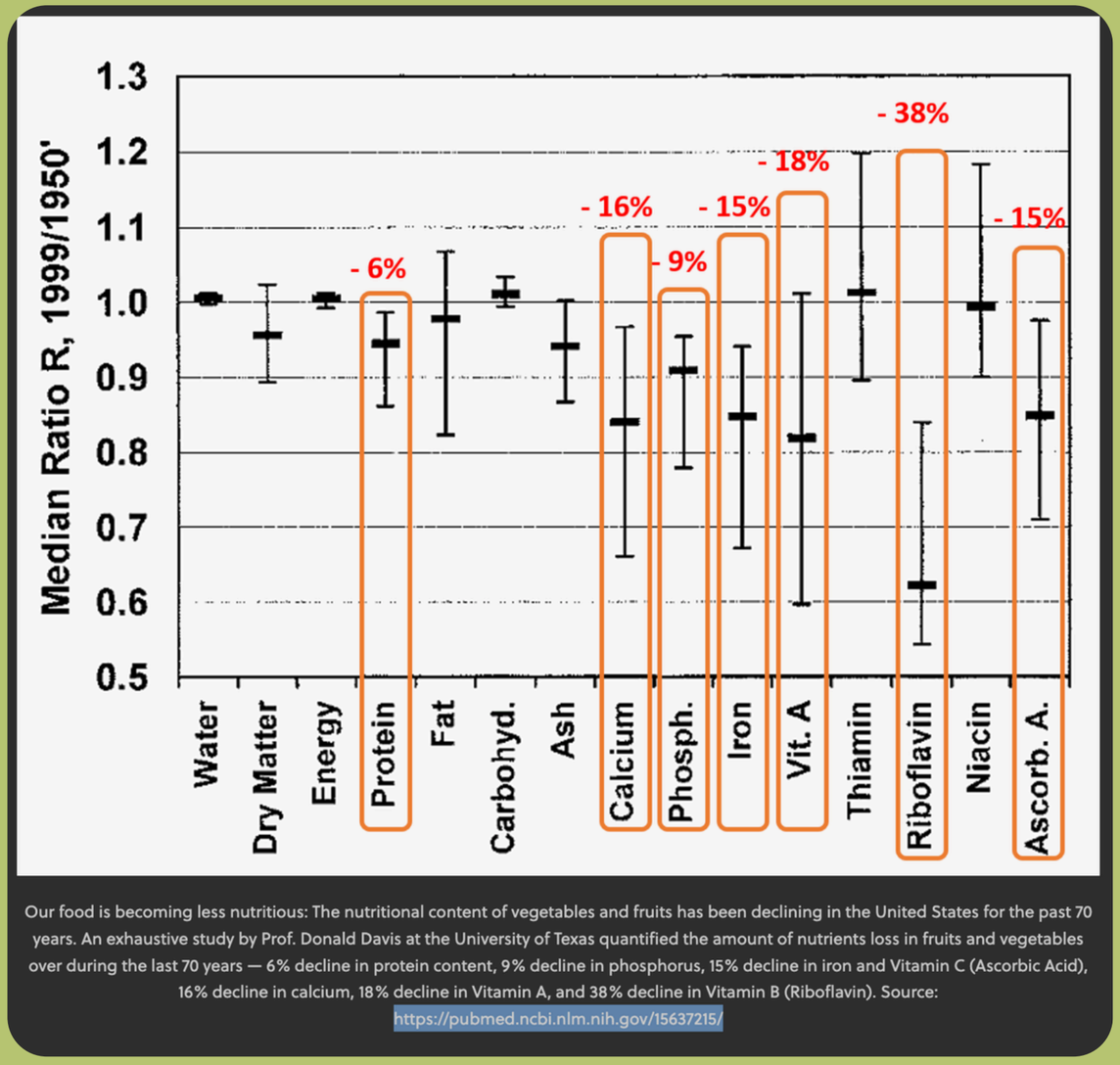
% of US Population Ages 1 & Older Who Are Below & At Or Above Each Dietary Goal

Healthy Plants & Animals

=

Healthy Humans

Nutrient Declines



Our food is becoming less nutritious: The nutritional content of vegetables and fruits has been declining in the United States for the past 70 years. An exhaustive study by Prof. Donald Davis at the University of Texas quantified the amount of nutrients loss in fruits and vegetables over during the last 70 years — 6% decline in protein content, 9% decline in phosphorus, 15% decline in iron and Vitamin C (Ascorbic Acid), 16% decline in calcium, 18% decline in Vitamin A, and 38% decline in Vitamin B (Riboflavin). Source: https://pubmed.ncbi.nlm.nih.gov/15637215/

(Davis, J Am Coll Nutr, 2004)

Mineral depletion in vegetables 1940-1991

Average of 27 kinds of vegetables

- Copper - declined by 76%
- Calcium - declined by 46%
- Iron - declined by 27%
- Magnesium - declined by 24%
- Potassium - declined by 16%

Mineral depletion in meat 1940-1991

Average of 10 kinds of meat

- Copper - declined by 24%
- Calcium - declined by 41%
- Iron - declined by 54%
- Magnesium - declined by 10%
- Potassium - declined by 16%
- Phosphorus - declined by 28%

Source: Thomas, D.E. (2003). A study of the mineral depletion of foods available to us as a nation over the period 1940 to 1991. Nutrition and Health, 17: 85–115.

(Thomas, Nutr Health, 2003)

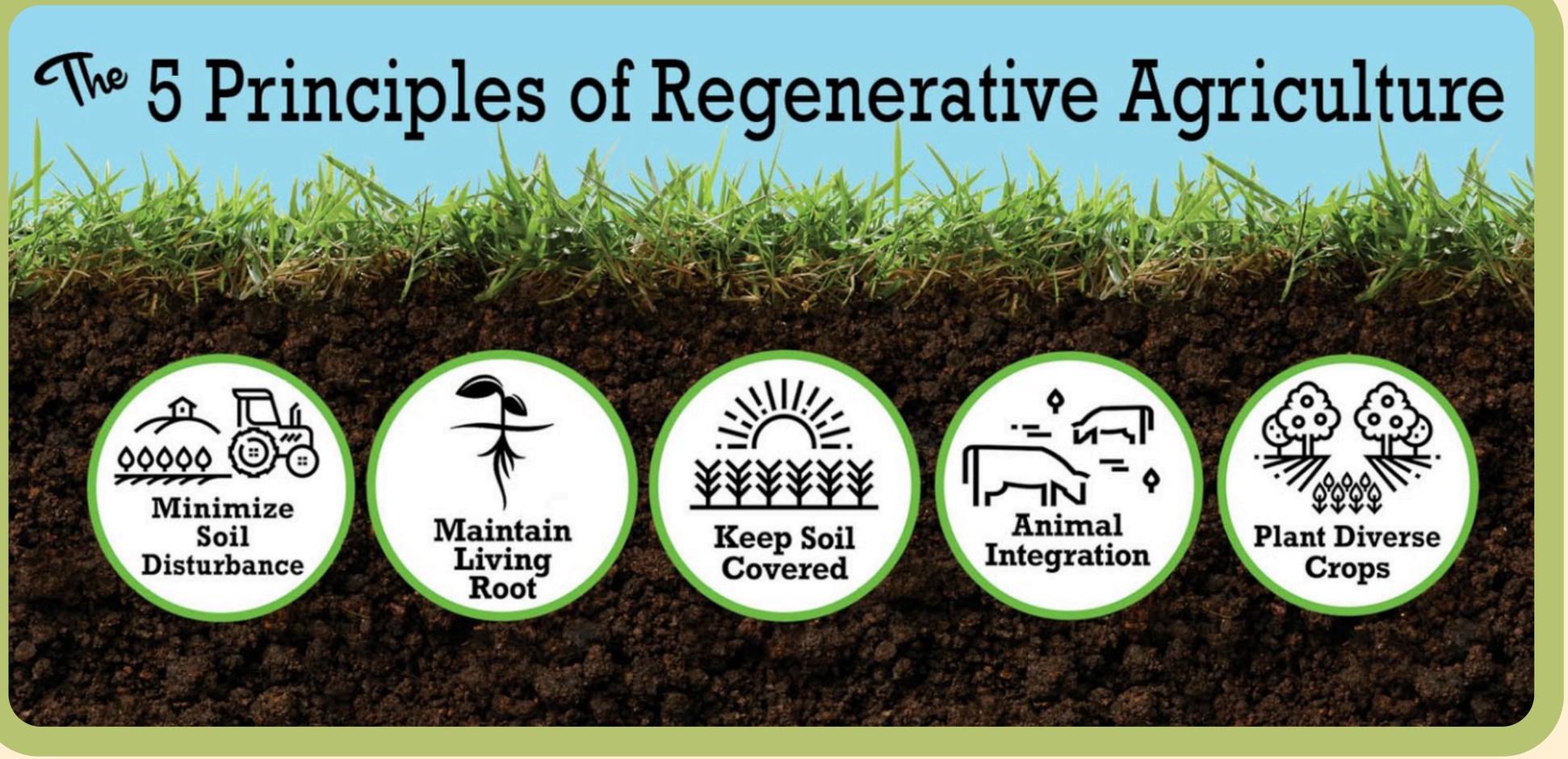
Nutrient Declines

Are we taking these nutrient declines into account in our nutrition recommendations??

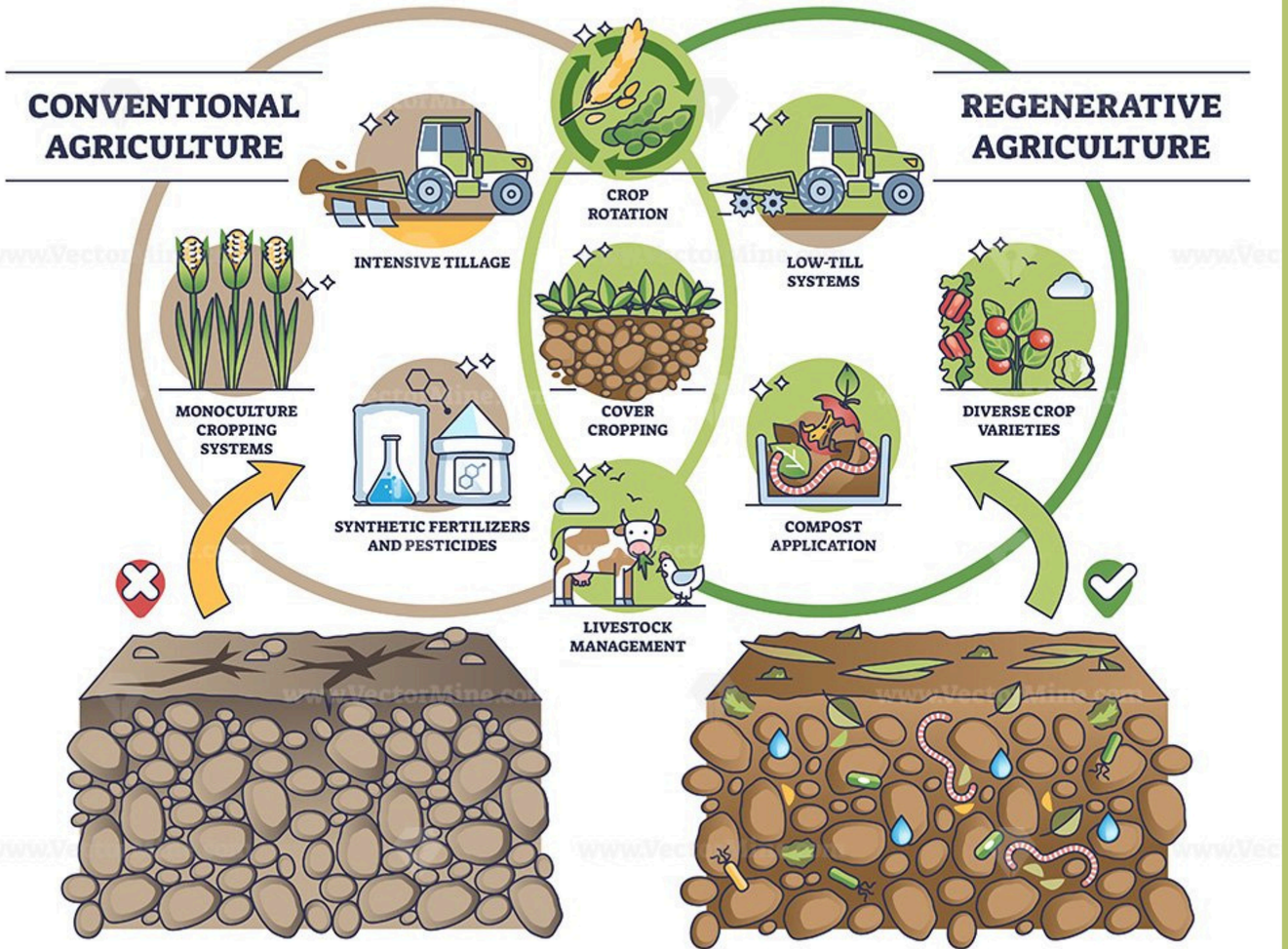
HIGH PESTICIDE USE	inhibit soil microbes & fungi, nutrient cycling and the plants ability to access nutrients
HIGH NITROGEN FERTILIZERS	affects vitamin/mineral content of plants, decreasing calcium, iron and vitamin C
SELECTING HIGH-YIELD CROP, PEST-RESISTANT VARIETIES	focus on quantity, not quality
AGGRESSIVE AGRICULTURE (LACK OF LAND REST, COVER CROPS AND ROTATION)	dilutes nutrients in plants
INCREASE CO2	causes “dilution” effect in plants: increases carbohydrates & decreases nutrients [protein (10%), iron (16%), zinc (9%) and magnesium (9%)]
POST-HARVEST HANDLING AND STORAGE	temp changes, light & oxygen exposure

(Bhardwaj, Foods, 2024)

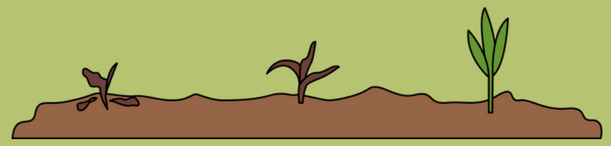
Regeneration



Regeneration



Healthy Soil = Healthy Humans



• Aggressive farming practices • Monocropping • Reliance on fertilizer • Damage to microbial life • Overuse of pesticides • Nutrient deficiency	• No rest/sleep • Lack of diet variety • Reliance on supplements • Dysbiosis • Overuse of antibiotics • Nutrient deficiency

The difference between chorophyll and hemoglobin is just one atom of out 143 - magnesium vs iron.

Healthy Soils = Healthy Humans

- **Soil Organic Matter (SOM)** is the fraction of soil composed of materials derived from living organisms, including plant and animal residues, microbial biomass, and substances produced by soil organisms, at various stages of decomposition.

- **SOM is plant food**
  - **more SOM = more nutrients for the plant = more nutrients for us**

- **Soil Microbial Life vs Human Microbiome**
  - Microbes pre-digest nutrients to make them bioavailable for the plant (aka “external microbiome”)
  - Similar to the gut microbiome in production of vitamin K and B vitamins
  - Microbes provide the plant’s immune system and protect against pathogens

Regenerative vs. Conventional

Dirt ≠ Soil

Regenerative vs. Conventional

Nutrient Differences in Grass-fed vs Grain-fed Beef				
	Grass-fed, raw 8oz	%DV	Grain-fed, raw 8oz	%DV
Calories	432		**568**	
Protein	**43g**		38g	
Total Fat	28g	33%	**44g**	52%
Saturated Fat	12g	43%	**16g**	57%
Omega-3	**200mg**		108mg	
Niacin	**18mg**	95%	9.6mg	51%
Folate	**28mcg**	7%	16mcg	4%
Vitamin B12	**4.8mcg**	80%	1.7mcg	28%
Choline	**152mg**	31%	126mg	26%

(Vliet, Beef Nutrient Density, 2022)

Lightning Rock Cattle, Walterboro SC

Regenerative vs. Conventional

Beef fatty acid comparison.

Fatty acid	Regen.	Regional	Conv.	Ratio
	(g/100 g)	(g/100 g)	(g/100 g)	(Regen/Conv)
Conjugated linoleic (CLA)	0.0208	0.0142	0.0067	3.1
Alpha linolenic (ALA)	0.0622	0.0369	0.0099	6.3
Eicosapentaenoic (EPA)	0.0120	0.0112	0.0078	1.5
Docosapentaenoic (DPA)	0.0262	0.0184	0.0166	1.6
Docosahexaenoic (DHA)	0.0026	0.0014	0.0015	1.7
Total omega-3	0.1056	0.0693	0.0358	2.9
Total omega-6	0.1416	0.1508	0.2216	0.6
Omega-6/Omega-3	1.3140	2.1777	6.1933	0.2

Omega-6 to omega-3 ratio one fifth of conventional beef (1.3:1 vs 6.2:1)

Pork fatty acid comparison.

Fatty acid	Regen.	Regional	Conv.	Ratio
	(g/100 g)	(g/100 g)	(g/100 g)	(Regen/Conv)
Conventional				
Alpha linolenic (ALA)	0.1537	0.0717	0.0136	11.3
Eicosapentaenoic (EPA)	0.0021	0.0015	0.0011	1.9
Docosapentaenoic (DPA)	0.0197	0.0126	0.0062	3.2
Docosahexaenoic (DHA)	0.0054	0.0021	0.0012	4.5
Total omega-3	0.2131	0.0982	0.0229	9.3
Total omega-6	1.6964	1.0804	0.5605	3.0
Omega-6/Omega-3	7.9610	11.0060	24.4306	0.3

Regenerative pork had 9x as much omega-3's as conventional

(Montgomery, Envr Sci, 2022)

Regenerative Vs Conventional

Avg. increase in nutrients in regenerative vs conventional in common crops (cabbage, peas, soy, corn, sorghum)	
Vitamin K	34%
Vitamin E	15%
Thiamine	14%
Riboflavin	17%
Phophorous	16%
Copper	27%
Calcium	11%
Caretonoids	15%
Phenolics	20%
Phytosterols	22%

(Montgomery, Envr Sci, 2022)

Phytochemicals!

- protect plants
- contribute the flavor, color and smell of foods
- protect humans - antioxidants & anti-inflammatory effects

Food Miles

Nutrient loss in foods caused by:

- temperature
- light
- relative humidity
- handling
- oxygen exposure
- processing

Nutrients most affected:

- vitamin C
- vitamin B12
- phytochemicals

Study: Lettuce

Nutrient Losses Day 4 on Retail Shelf

Vitamin C: 81%

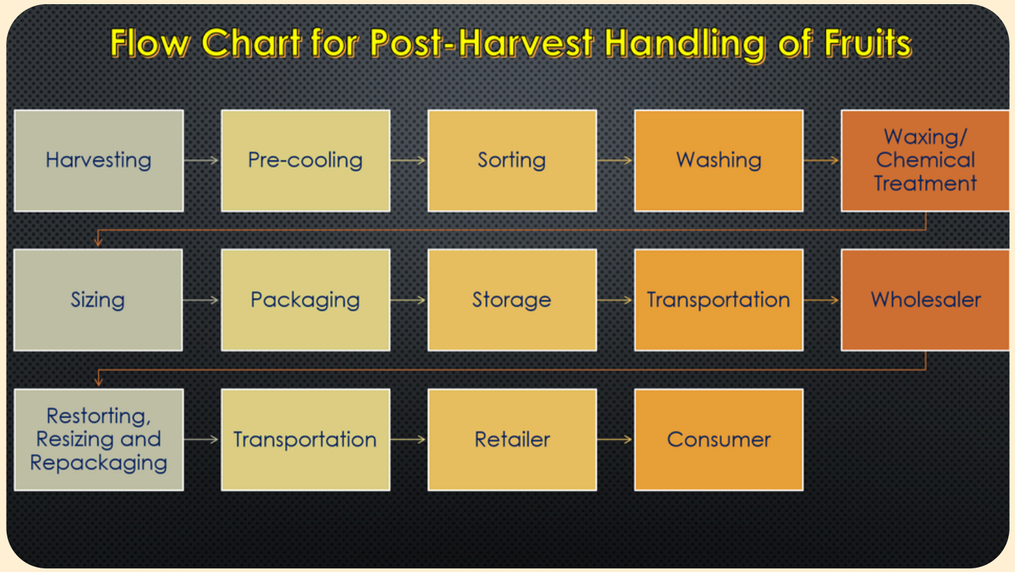
Magnesium: 14%

Carotenoids: 48%

Vitamin K: 24%

Calcium: 25%

(Managa, Food Sci & Nutr, 2018)



Prescribing Food

Calories ≠ Nutrition

- **Malnutrition** is an imbalance between the nutrients your body needs to function and the nutrients it gets. You can be malnourished from an overall lack of calories, or you might have a protein, vitamin or mineral deficiency.

- **Food Is Medicine** is the provision of healthy food to prevent, manage, or treat specific clinical conditions in a way that is integrated with the health care sector.

- **Food Insecurity** is having insufficient access to enough food needed for a healthy, active life.

- **Nutrition Security** is an emerging complementary concept that focuses more on the nutritional composition of available foods, and is defined by the USDA as; “all Americans have consistent and equitable access to healthy, safe, affordable foods essential to optimal health and well-being.”

(Volpp, Circulation, 2023)
(Coleman-Jensen, USDA, 2022)

The Prescription

#1

Quality of food is just as important as the quantity.

#2

Where food comes from and how it is grown/raised matters.

#3

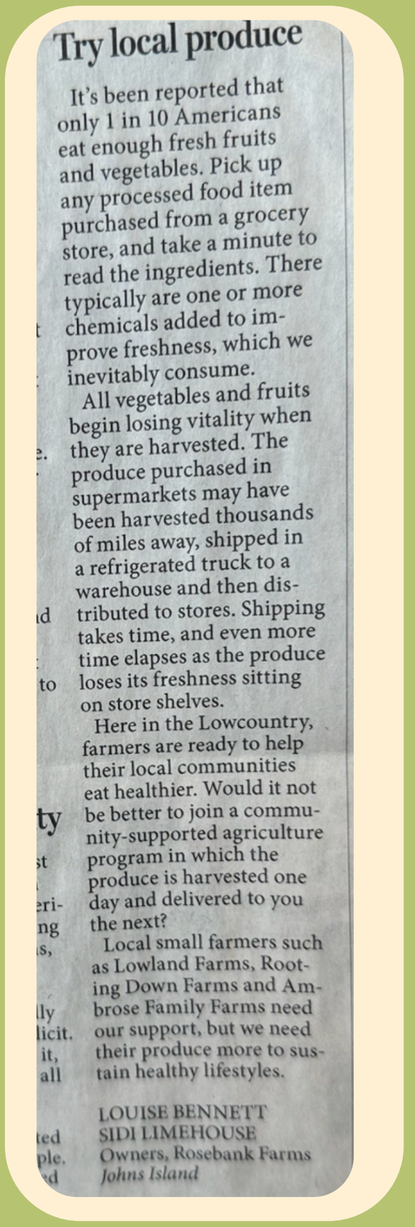
Think “food first” when it comes to health and longevity.

#4

Don’t underestimate food synergy- eat a variety of whole foods.

#5

Eat less, but more nutritious food.



Try local produce

It’s been reported that only 1 in 10 Americans eat enough fresh fruits and vegetables. Pick up any processed food item purchased from a grocery store, and take a minute to read the ingredients. There typically are one or more chemicals added to improve freshness, which we inevitably consume.

All vegetables and fruits begin losing vitality when they are harvested. The produce purchased in supermarkets may have been harvested thousands of miles away, shipped in a refrigerated truck to a warehouse and then distributed to stores. Shipping takes time, and even more time elapses as the produce loses its freshness sitting on store shelves.

Here in the Lowcountry, farmers are ready to help their local communities eat healthier. Would it not be better to join a community-supported agriculture program in which the produce is harvested one day and delivered to you the next?

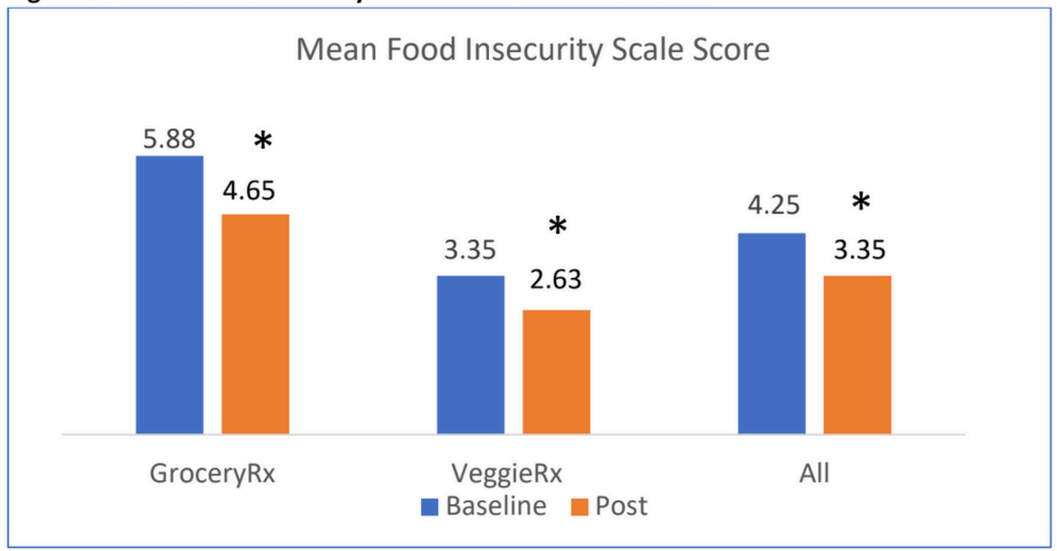
Local small farmers such as Lowland Farms, Rooting Down Farms and Ambrose Family Farms need our support, but we need their produce more to sustain healthy lifestyles.

LOUISE BENNETT
SIDI LIMEHOUSE
Owners, Rosebank Farms
Johns Island

SC Produce Prescription Programs

GroceryRx & VeggieRx

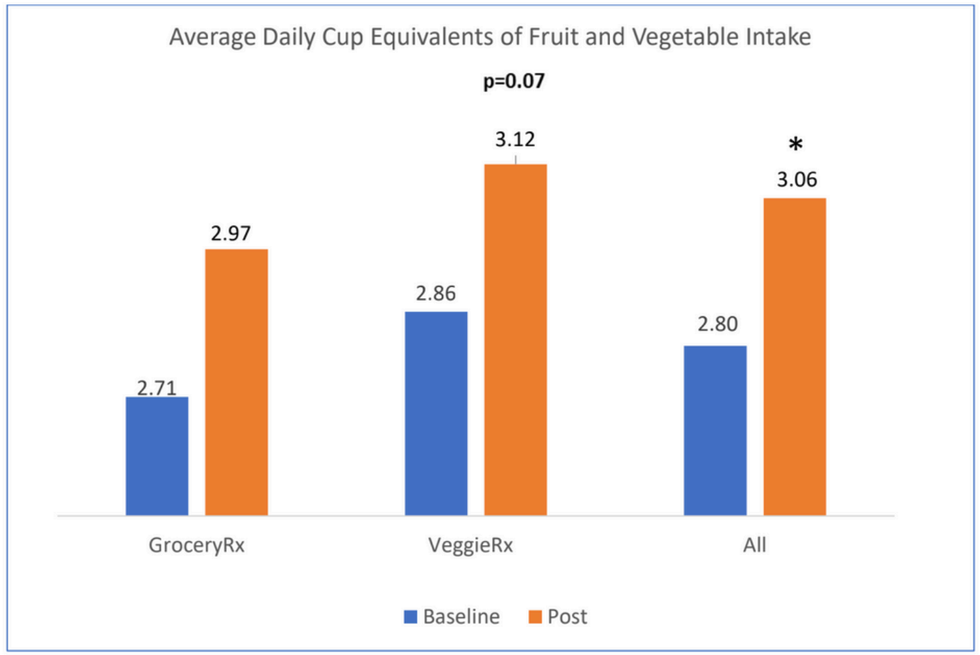
Figure 2. Mean Food Insecurity Scale Score: Baseline vs. Post



Asterisks (*) indicate $p < 0.05$, statistical significance between baseline and post-assessment, a paired Student's t-test

Lower is better.

Figure1. Average Daily Cup Equivalents of Fruit and Vegetable Intake: Baseline vs. Post

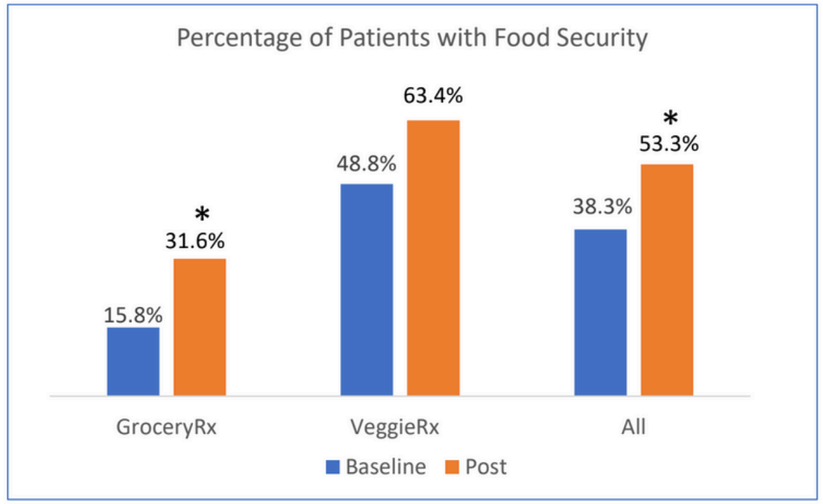


Asterisks (*) indicate $p < 0.05$, statistical significance between baseline and post-assessment, a paired Student's t-test.

Higher is better.

SC Produce Prescription Programs

Figure 3. Percentage of Patients with Food Security

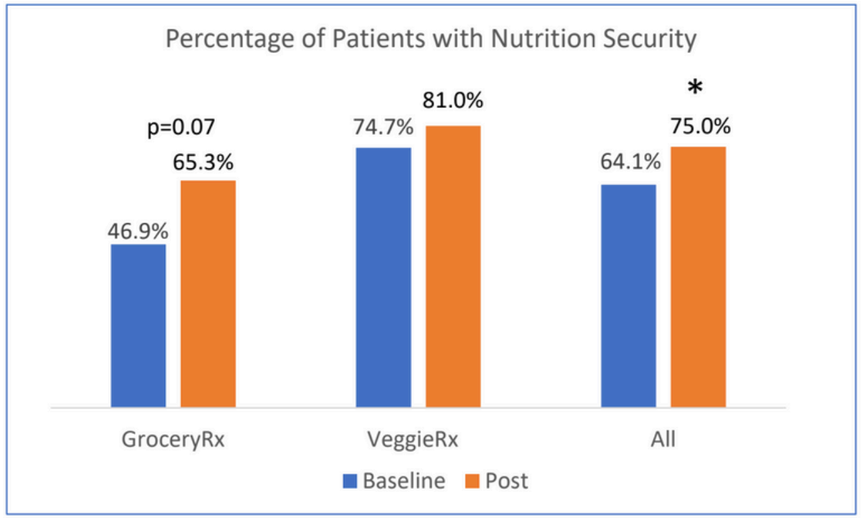


The data is presented as 'Percentage of Patients with Food Security' and was analyzed using a paired McNemar test. The McNemar test is used to determine if there are differences on a dichotomous dependent variable between two related groups. A dichotomous variable is a categorical variables with two categories only.

Asterisks (*) indicate $p < 0.05$, statistical significance between baseline and post-assessment.

Higher is better.

Figure 5. Percentage of Patients with Nutrition Security: Baseline vs. Post



The data is presented as 'Percentage of Patients with Nutrition Security' and was analyzed using a paired McNemar test.

Asterisks (*) indicate $p < 0.05$, statistical significance between baseline and post-assessment.

Higher is better.

GROCERYRx: Food Is Medicine in Action

The Mission

GroceryRx IS
“Food is Medicine.”
GRx strives to make health truly equitable through access, security, education, empowerment, and most importantly, community.

The Vision

A simple, yet radical dismantling and reconfiguration of our broken food and medical systems. We bridge healthcare, community and local agriculture to provide targeted nutrition education and healthy food prescriptions to create generational health change.

Outcomes

PRIMARY OUTCOMES

- 1.5% reduction in hemoglobin A1C in 6 months
- 7% weight loss and maintenance of weight lost
- 4 cups of vegetables daily
- 150 minutes of moderate activity per week

SECONDARY OUTCOMES

- Improved quality of diet
- Improved self-reported quality of life and perceived health
- Improved food security status

How GroceryRx WORKS

AND COOKING CLASSES

GRX classes are an hour long & focus on helping individuals reach their personal health goals, in addition to expanding knowledge & consumption of a wide variety of fresh foods.

Biweekly Bundle of Fresh Fruits and Vegetables

Monthly 1-on-1 Calls

with a registered dietitian focusing on participants' individual goals.

UPON GRADUATION

***andddd attending 10 of the 12 classes,* participants will continue to receive groceries for 6 months after class!**

COMMUNITYSUPPORTEDGROCERY.COM

Tools & Applying in Practice

The RD's Role

- Adjust recommendations beyond "eat your fruits and vegetables".
- Counsel with dignity- don't assume people are not interested.
- Be a conscious consumer and a role model for family, friends and clients/ patients.
- Advocate for a better food system.
  - Food is Medicine Program Act of 2024
- Support & refer to FIM programs in your work.

Resources

Continuing Education

- U.S. Office of Disease Prevention and Health Promotion: Food Is Medicine
  - Promising Practices and Tools → Training Education and Tools

Books

- What Your Food Ate, David R. Montgomery, Anne Bikle
- The Real Cost of Cheap Food, Michael Carolan
- Dirt to Soil, Gabe Brown

Documentaries

- Kiss The Ground, 2020
- Common Ground, 2023

What You Can Do

Farmer's Markets

Sea Island Farmer's Market, Summerville, Mt Pleasant, North Charleston, Marion Square, The Pour House, Lowcountry Street Grocery

CSA's (Charleston)

Rooting Down Farms, Spade and Clover Gardens, The Green Heart Project, Vital Missions Farms, Legare Farms, Lowland Farms, Wando River Farm, Community Supported Grocery

Certified Regenified

Maker's Mark
King Arthur Flour
Vital Farms
Dr. Bronner's
Nature's Path
Gaia Herbs

SC Farms

Fireant Farms (John's Island)
Peculiar Pig Farm (Dorchester)
Wishbone Heritage Farms (St George)
Spade & Clover Gardens (John's Island)
Lightning Rock Cattle (Walterboro)
Bioway Farm (Ware Shoals)
Chucktown Acres (Awendaw)
Wild Hope Farms (Chester)
Wabi Sabi Farms (Cordesville)

Other

- Grow your own!
- Support family & friends interested in agriculture
- Buy from a neighbors garden
- Host a market at school, church, etc

Connect

olivia@lowcountrystreetgrocery.com

www.communitysupportedgrocery.com

Lowcountry Street Grocery @lowcountrystreetgrocery

 @grocery.rx

COMMUNITY SUPPORTED CHS GROCERY USA @communitysupportedgrocery

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