

NEW ENGLAND FEEDING NEW ENGLAND

VOLUME 1

ESTIMATING RESILIENT EATING PATTERNS

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NEW ENGLAND FEEDING NEW ENGLAND

» **Volume 1: Estimating Resilient Eating Patterns**

Volume 2: Estimating Production for 30% Regional Self-Reliance

Volume 3: Economic Impact of New England's Food System

Volume 4: Understanding Market Channels and Food Expenditures

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On the cover, clockwise from top left: Taking Root Symposium at the University of Vermont (Nate Stevens); Throwback Brewery in North Hampton, New Hampshire (Ink + Light Creative); Bright Street Housing Community Garden (VT Community Garden Network); East Boothbay General Store in Maine (www.ebgs.com); Vermont school lunch (Hunger Free Vermont); Butch and Babe's restaurant (Montgomery Sheridan)

What would it take for *30%* of the food consumed in New England to be regionally produced by *2030*?

What will it really take to grow, raise, produce, harvest, and catch more regional food and move it through a complex supply chain to our homes and other places we eat? What do we need to do in the near term, by 2030, to make tangible progress towards this bold goal? How might the increasing and escalating impacts of climate change impact our ability to feed ourselves? What can we do as a region to make our food system more equitable and fair, resilient and reliable? To answer these questions, the **New England State Food System Planners Partnership**—a collaboration between six state-level food system organizations—and Food Solutions New England—who are mobilizing their networks to strengthen and grow the New England regional food system—convened four teams of researchers.

This research volume examines the question: **If we ate in a healthier, more resilient way, could more of our food be supplied by regional production?** To calculate how much food 15.3 million New Englanders currently consume—and how much 15.6 million New Englanders might consume in 2030—a *Dietary Patterns Team* analyzed dietary patterns across the major food groups. Meeting a goal of 30% regional food self-reliance will require significant cultural change in how and what we eat, and major investments in improving access to healthy food.

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1 Introduction

Can the six New England states provide *30%* of their food from regional farms and fisheries by *2030*?

This question guided research conducted by the New England State Food System Planners Partnership to help policy-makers, funders, food system businesses and stakeholders, community groups, and consumers understand the relative resilience of New England's food system. Why does this question matter? After all, America's food and beverage production capacity—farms, fisheries, processors, and manufacturers—is enormous, abundant, and diverse. Food imports from around the world have steadily increased. Our food distribution systems are timely and efficient. Our grocery stores and restaurants are stocked, affordable, and convenient. Even our waste disposal systems are a flush and weekly pickup away.

In most of our lived experiences, we have not had to answer the question—***Where does our food come from?***—with specificity, although our ancestors certainly could. And yet, accumulating evidence indicates that we are entering a new era of human experience. Due to linked challenges that are *simultaneously taking place everywhere across the planet*, Americans will no longer be able to reasonably expect that every food they want will be easily available for them to buy year-round.

New England Feeding New England

If where our food comes from suddenly mattered, would New England be prepared with a reliable, safe, and abundant food supply? What will it really take to grow, raise, produce, harvest, and catch more regional food and move it through supply chains to our homes and other places where we eat? There are very few examples of long-term planning for healthy, reliable food supplies. Unlike other systems that provide essential goods and services, like energy and water, *no one* is currently in charge of planning and preparing for healthy, reliable, and resilient long-term food supplies.

In 2014, Food Solutions New England published A New England Food Vision, which imagined what it would take to produce 50% of New England's food supply from regional sources by 2060. It found that the region *could* theoretically supply 50% of its food by focusing production on fruits, vegetables, dairy products, and grass-finished meats, while importing the majority of food grains, feed grains, oilseeds, and sweeteners. Based on a target of 2,300 calories per person per day, 4 million additional acres of land in agriculture would be required to do this (about three times more than is currently in active production, although about 6.8 million acres were in cropland and pasture in New England in 1945).

Volume 1 Research Summary

If we ate in a healthier, more resilient way, could more of our food be supplied by regional production?

TODAY NEW ENGLANDERS EAT ABOUT **2,940** CALORIES PER DAY (INCLUDES ALCOHOL)

THIS IS WELL ABOVE DIETARY GUIDELINES FOR MOST PEOPLE

A SWITCH TO "RESILIENT EATING" WOULD MEAN REDUCING CONSUMPTION BY 600 CALORIES

2,320 CALORIES PER DAY

New England Feeding New England updates the analysis from *A New England Food Vision* and explores opportunities at an intermediate and more easily imaginable range: **what would it take for *30%* of the food consumed in New England to be regionally produced by *2030*?** To explore key questions about our long-term food supply, four research teams were assembled across New England:

1. **Dietary Patterns Team:** How would food consumption patterns have to change in order to make the best use of what regional food producers can grow, harvest, and catch? This Team developed dietary scenarios for "Unchanged Eating"—a continuation of how we currently eat—and "Resilient Eating"—a dietary pattern much more closely in alignment with U.S. Dietary Guidelines—in 2030 (Volume 1).

2. **Food Production Team:** How much food do we produce in New England compared to how much food we consume? The Food Production Team analyzed current regional food self-reliance and developed a model to explore New England's potential to increase its self-reliance based on dietary scenarios prepared by the Dietary Patterns Team (see Volume 2).

3. **Economic Impact Team:** Do we have the right mix of industries to ramp up food production? The Economic Impact Team estimated the number of people employed in New England's food system, the economic impact of food system activities, economic multipliers for each industry, and areas of growth or contraction (see Volume 3).

4. **Market Demand Team:** What market channels offer the best opportunities for sourcing local and regional food products? The Market Demand Team analyzed market concentration trends, sales data from retail food market channels, consumer expenditures for the six states, and explored specific challenges within each market channel (see Volume 4).

Volume 1 analyzes dietary patterns across the major food groups to explore if more of our food could be supplied by regional production if we ate in a healthier, more resilient way. The Dietary Patterns Team addressed the following tasks:

- Determine the current regional pattern of food consumption
- Examine long-term trends in dietary patterns
- Provide dietary scenarios for 2030
- Review results with a panel of nutrition experts
- Identify data limitations

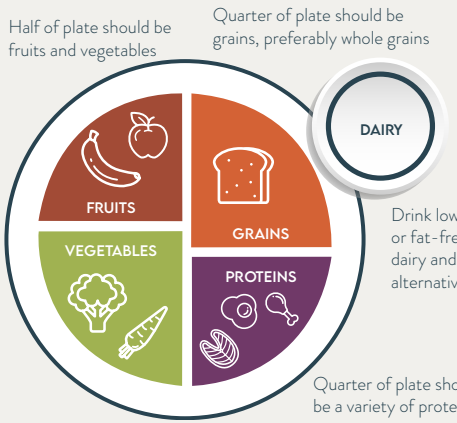
While food preferences are personal—albeit strongly influenced by family, traditions, society, advertising, and other factors—decades of scientific research inform USDA dietary guidelines, which encourage Americans to eat diets *high* in fruits, vegetables, and fiber and *low* in saturated and trans fat, sodium, and added sugars. Author Michael Pollan famously summarized three simple rules for healthy eating: "Eat food. Not too much. Mostly plants."[1] But that is not how most of us eat. The average adult American consumes about **2,780 calories per day** across all food groups, including added fats and sugars (**2,940** calories if alcohol is included). This is well above dietary guidelines for the majority of men and women.

What if New Englanders were to eat in a healthier way, resembling, on average, the USDA dietary guidelines? Our research team quickly realized it was impossible to project exactly what the *most likely* complete pattern of food consumption in 2030 would be from available data. We also agreed that it was presumptuous to prescribe an *ideal* dietary pattern for the region, and difficult to predict how far people's eating habits might move in that direction by 2030. Therefore, we decided to identify two ends of a spectrum of possibilities:

One end, called **"Unchanged Eating,"** is a simple continuation of the way people, on average, are eating today: somewhere between 2,700-2,900 calories per day. The other end, called **"Resilient Eating,"** closely follows USDA dietary guidelines, with a few important exceptions.

The way New Englanders actually eat in 2030 will probably fall between Unchanged Eating and Resilient Eating. By considering both ends of the spectrum, the Production Team of researchers was able to model the challenges and opportunities of achieving greater regional self-reliant food production under either scenario (see Volume 2).

USDA Dietary Guidelines



USDA dietary guidelines do not prescribe what foods to eat—rather, they provide widely accepted recommendations for weekly consumption within broad food types to make up a healthy, balanced diet. People can meet these recommendations in a variety of ways.

Minimize added sugars, saturated fats, and sodium

Nutrition Labels

In 2020, the Food and Drug Administration improved the appearance and content of nutrition labels with larger, bold fonts and updated Daily Values.

Nutrition Facts

8 servings per container
Serving size **2/3 cup (55g)**

Amount per serving **Calories**	**230**
	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Serving sizes (e.g., cups, ounces) vary by type of food. Serving size is not an actual recommendation of how much to eat.

Calories are units of energy provided by each serving of food or drink. Calorie requirements vary by age, sex, weight, height, and physical activity level.

Daily Values show how a nutrient in a serving of food contributes to a total daily diet (based on a 2,000 calorie per day diet). A Daily Value of 5% or lower is considered low. A Daily Value of 20% or more is considered high. The general recommendation is to choose foods that are higher in dietary fiber, vitamin D, calcium, iron, and potassium and lower in saturated fat, sodium, and added sugars.

2 Exploring Two Scenarios

Estimating "Unchanged Eating"

Comparing Data Sources

We analyzed current dietary patterns using USDA-ERS Loss-Adjusted Food Availability (LAFA) national data. We compared these estimates to National Health and Nutrition Examination Survey (NHANES) survey data, and also considered whether they could be corrected to better fit the New England region. We concluded that LAFA estimates were appropriate for the purposes of this project. We also looked at long-term trends in consumption of different foods.

The LAFA dataset enumerates production and importation of all food commodities consumed in the United States, which serves to estimate per capita food availability across the entire national population. The data are adjusted for food losses at various stages, such as spoilage, retail losses, and plate waste to arrive at estimates of actual per capita food intake. The resulting estimates for each commodity are reported in terms of *servings*, as framed in the 2020-2025 Dietary Guidelines for Americans.

We averaged these consumption estimates across the most recent 10-year period (most frequently between 2010-2019) so that the Production Team could calculate a "net balance" comparison of food currently produced and consumed within New England. The consumption estimates were also translated from servings per capita to caloric consumption per capita by multiplying the approximate calories per serving, derived from the USDA Nutrient Database for Standard Reference. Overall calories consumed in the U.S. diet were then calculated by summing all individual food commodities within the major food groups. Thus, each food commodity was summarized by total servings consumed per capita, calories consumed per capita, and also as a percentage of total food group consumption. Data for average caloric consumption from alcohol was added as well.

We compared this LAFA consumption data with survey data from NHANES. NHANES aims to assess the health and nutritional status among American children and adults through a combination of interviews and physical exams (see Table 1 for a sample of NHANES research findings). As part of the NHANES "What We Eat in America" (WWEIA) effort to understand chronic disease risk, dietary intake data is collected on two days (3-10 days apart) via a 24-hour recall. For the current project, WWEIA Data Briefs from 2003-2018 were reviewed, and the 2017-2018 brief for adults ages 20 years and older was compared to LAFA 2015-2019 averages (Table 2).

TABLE 1: Key NHANES Food Intake Data Highlights

Data Sources	Sample Demographics	Key Data Highlights
Changes in Total Fruit and Fruit Juice Intakes of Individuals: WWEIA, NHANES 2005-2006 to 2017-2018, Data Brief 41	All (2+ years)	Estimated mean intakes of total fruit, which includes intact fruit and fruit juice, did not change significantly among children, adolescents, and adults from 2005-2006 to 2017-2018. Mean intakes of fruit juice obtained from single- and multi-ingredient foods decreased among children, adolescents, and adults during this period.
Intake of Vegetables by Adults, What We Eat in America, NHANES 2017-2018, Data Brief 39	Adults (20+ years)	The most frequently consumed vegetables by adults were potatoes and salad. Vegetable intake was reported least often by Hispanics, and most often by Non-Hispanic Asians and Non-Hispanic Whites. The percentages of people who consumed vegetables increased with income. Vegetables were reported most frequently at dinner, followed by lunch.
Intake of Fruit by Adults, What We Eat in America, NHANES 2017-2018, Data Brief 37	Adults (20+ years)	Bananas were reported most frequently, followed by apples, grapes, oranges, strawberries and mixed fruit. Non-Hispanic Asians and Hispanics reported fruit intake more frequently, whereas Non-Hispanic Blacks and Non-Hispanic Whites had fruit less frequently. Fruit consumption increased as income increased.
Food Pattern Group and Macronutrient Intakes of Adults: WWEIA, NHANES 2003-2004 to 2017-2018, Data Brief 35	Adults (20+ years)	From 2003-2004 to 2017-2018, added sugars and solid fats intakes substantially decreased. An increase in whole grain intake was significant, but very small. Total fruit intake remained the same, but fruit juice intake significantly declined. Adults ate about 3.5 times more protein foods of animal origin (meat, poultry, and seafood) than of plant origin in 2017-2018.
Beverage Choices among Adults: WWEIA, NHANES 2017-2018, Data Brief 31	Adults (20+ years)	Water was the most commonly consumed beverage by adults followed by coffee/tea and sweetened beverages, mostly in the form of soft drinks. Sweetened beverages were less likely to be consumed by Non-Hispanic Asian and Non-Hispanic White adults than Non-Hispanic Blacks or Hispanics. Beverages provided 17% of daily energy intake for adults, and 54% of added sugar intake.
Protein Intake of Adults What We Eat in America, NHANES 2015-2016, Data Brief 29	Adults (20+ years)	Protein intakes of adult males were about one-third higher than adult females. Protein intakes have not changed significantly in the past 10 years. The percentage of energy intake provided by protein was 16% among all adults. Animal sources of protein contribute about two-thirds of adults' protein intakes.
Food Patterns Equivalents Intakes by Americans: What We Eat in America, NHANES 2003-2004 and 2013-2014, Data Brief 17	All (2+ years)	Americans reduced their added sugars intake in a 10-year period. The estimated mean intakes of added sugars substantially decreased by 3.6 tsp. eq., from 21 tsp. eq. in 2003-2004 to 17.4 tsp. eq. in 2013-2014. A reduction in solid fats intake was noted (a 12.3 gram reduction), and a very small, but significant increase in whole grains intake from 0.6 oz. eq. in 2003-2004 to 0.9 oz. eq. in 2013-2014 was evident.
A Comparison of Food Patterns Equivalents Intakes by Americans: What We Eat in America, NHANES 2003-2004 and 2011-12, Data Brief 16	All (2+ years)	Estimated mean daily intakes of added sugars by Americans substantially decreased by 2.6 tsp eq (11 grams) from 21 tsp eq. in 2003-2004 to 18.4 tsp eq in 2011-2012; there was an 11 gram reduction in intake of solid fats; a small but significant increase in whole grain intake from 0.6 to 0.9 oz. eq.

TABLE 2: Comparison of NHANES (2003-2018) to LAFA Data (2015-2019)

Food Group	NHANES 2003-2004 (Ages 2+)	NHANES 2003-2004 (Ages 20+)	NHANES 2011-2012 (Ages 2+)	NHANES 2011-2012 (Ages 20+)	NHANES 2013-2014 (Ages 2+)	NHANES 2013-2014 (Ages 20+)	NHANES 2017-2018 (Ages 20+)	LAFA 2015-2019 Averages Entire Population	% Diff. Between LAFA and NHANES 2017-2018 Adults
Fruit (cups)	1	0.98	1.0	1.0	0.9	0.9	0.88	0.862	**-2.1%**
Fruit Juice (cups)							0.2	0.207	**3.5%**
Vegetable (cups)	1.5	1.64	1.5	1.6	1.4	1.5	1.55	1.616	**4.3%**
Dairy (cups)	1.8	1.6	1.8	1.6	1.7	1.6	1.45	1.584	**9.2%**
Total Grains (oz equiv)	6.9	6.9	6.8	6.8	6.6	6.6	6.6	6.642	**0.6%**
Whole Grains (oz equiv)	0.6	0.64	0.9	1.0	0.9	0.9	0.8		
Refined Grains (oz equiv)	6.3	6.21	5.9	5.8	5.7	5.7	5.8		
Protein: Nuts, seeds, soy, legumes (oz equiv)		1.18					1.39	0.98 nuts 1.02 beans	**43.9%**
Protein: Meat, poultry, seafood (oz equiv)	4.5	4.83	4.4	4.8	4.5	4.9	4.8	6.861	**42.9%**
Added Sugars (tsp equiv)		20.2	18.4	18.2	17.4	17.6	17.0	22.1	**30.0%**
Total Fats (grams)	66.8	67.3	61.8	64.0	60.7	63.0	67.5	63.99	**-0.02%**
Solids Fats (grams)	47.6	47.4	36.5	37.0	35.3	36	37	21.7	**-41.4%**
Oils (grams)	19.2	19.9	25.3	27.0	25.4	27.0	30.5	42.3	**56.6%**

Sources: USDA WWEIA Data Briefs 16, 17, and 35.

While most discrepancies between LAFA and NHANES were small, two differences stood out. The largest was for animal protein (including meat, poultry, and seafood). NHANES was 38.7% lower than LAFA at 4.8 oz eq/day vs. 6.6 oz eq/day. Added sugar intake was 17 tsp eq/day for NHANES compared to 22.5 tsp eq/day for LAFA, amounting to a 31.5% difference.

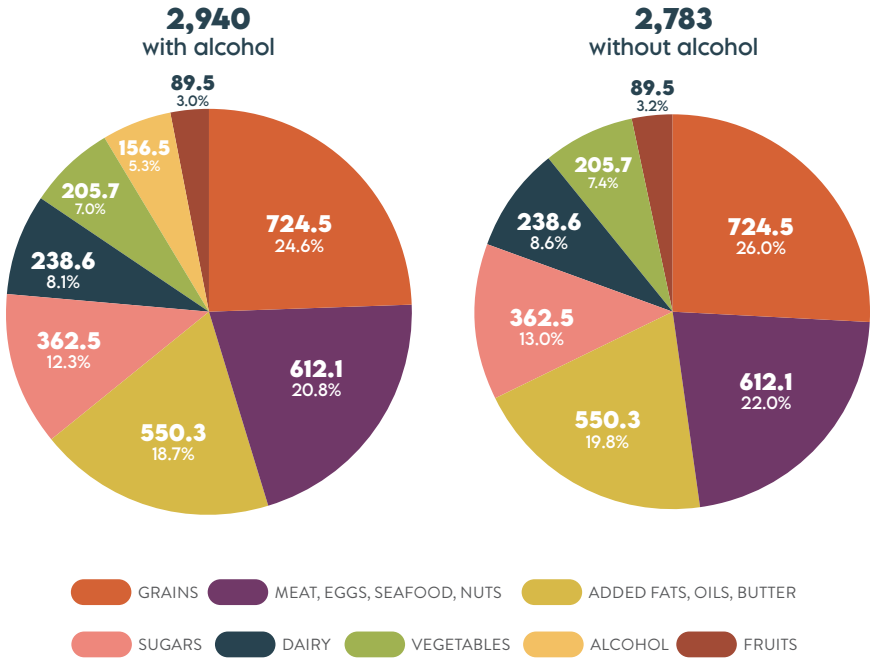
While little evidence has been documented to explain these discrepancies, at least one study has examined assumptions in the estimates of food loss in the LAFA dataset. Researchers note that loss estimates for meat, poultry, and seafood are especially difficult to accurately capture due to the iterative nature of processing and lack of reliable supplier shipment data. Thus, LAFA estimates of meat consumption may be overstated as estimates of loss are less reliable.[2]

Conversely, self-reported NHANES data may *underestimate* consumption for various reasons. Consumers may not be able to accurately state the level of added sugar or fats in their foods, as they are often visible only on the ingredients panel or nutrition label. Additionally, consumers may be less willing to accurately relay their level of consumption of foods that are perceived to be less healthful.

Ultimately, given the small differences for most food groups, and lack of a compelling reason to prefer NHANES estimates where there are differences, the research team decided to use the LAFA dataset to characterize the average diet of American consumers. These data were judged to be accurate enough for our purposes, and compatible with production estimates used elsewhere in the study. The LAFA dataset is available exclusively at the national level, with no information on regional subsets of the American population. All consumption levels noted in this report thus reflect the average American consumer, not the average New England consumer specifically. In other words, the average American has to suffice for the average New Englander. Recent studies of dietary intake and food purchasing suggest there are some regional differences by race and ethnicity, with the Northeast and West having higher diet quality overall.[3] However, we are not aware of any data with which to systemically modify the LAFA dataset to fit New England, and again, judged it to be sufficiently accurate for our purposes.

Overall, the average American was found to consume approximately 2,783 calories per day across all food groups, including fats and sugars, and 2,940 calories if we include alcohol (Figure 1). In terms of caloric intake, grains and protein-dense foods comprised nearly half of the average American diet. Added fats and sweeteners comprised another 33-38% (including alcohol). Fruits and vegetables comprised only about 10% of total daily calories.

FIGURE 1: Average U.S. Daily Food Intake in Calories, 2019



Source: USDA Loss-Adjusted Food Availability Data System.

Estimating "Resilient Eating"

Resilient Eating represents a healthier average across an entire population of 15.6 million people in 2030. It does not prescribe the exact way that each person should eat, but it is fundamentally a substantial reduction in sweeteners, fats, and processed foods. The recommendations are cast in broad food groups and subgroups, allowing for wide combinations of individual foods and cooking methods to meet them. Following the 2020-2025 Dietary Guidelines for Americans (DGAs) approach (Table 3), these recommendations "meet people where they are" and account for personal preferences, cultural traditions, and budgetary considerations.

While this goal most likely cannot be fully achieved by 2030, in our estimation, movement in the direction of healthier eating would be one important element in achieving greater regional resilience. **It is a fundamental premise of this project that everyone ought to have the means to achieve "resilient eating" in their own way. Food security is the foundation of resilience: people cannot be resilient without full access to culturally appropriate food. At the level of society, healthier eating greatly increases resilience.** Policies that help empower people to eat in healthier ways would lead to enormous health care savings.

Calorie Calculations

To use the DGAs to estimate consumption within food groups for the Resilient Eating diet, we first had to calculate the average recommended caloric intake across the entire regional population. The DGAs recommend specific targets for caloric intake that vary by age, gender, and activity levels, which were compared to national population projections expected in 2030. The weighted average of the projected population's caloric intake was taken by both gender and age, with the assumption that activity level was evenly distributed across the population.[4]

What is Resilient Eating?

***Resilience* refers to our collective ability to respond and recover from adverse conditions.** *External* risks—hurricanes, droughts, earthquakes—have always posed a threat to societies, but the modern world is now threatened by *manufactured* risks—climate change, health epidemics, ecological degradation, nuclear catastrophe, the COVID-19 pandemic—that are the result of human actions.

The opposite of resilience is *vulnerability*. Manufactured risks have increased vulnerability and decreased resilience across the world. While resilient systems exemplify flexibility, adaptability, diversity, redundancy, options, transparency, and inclusivity,[5] vulnerable systems reduce options, are rigid, opaque, and at risk of breakdown. Increasing evidence points to a food system "stretched to its limits...and beyond"[6] due to threats to long-term food production like climate change, an epidemic of diet-related health problems, market concentration in every food system sector, and more.

Resilient eating is an important element in overall regional food system resilience. Resilience goes beyond increased regional self-reliance in production of healthy food by sustainable methods: it must ensure that food is available to everyone. **Resilient eating is healthier eating *plus* improved access, greater food and nutrition security, support for local and regional food system businesses, and support for what local farms and fisheries can produce.** Resilient eating reduces vulnerability for individuals and, in doing so, increases community food security and empowerment.

This yielded an average 2,115 calories per capita daily consumption, if the DGAs were actually met. Accordingly, we used 2,100 calories for our preliminary version of "Resilient Eating." However, a panel of nutrition experts we assembled (see page 14) argued, and we concurred, that 2,100 calories would be unattainably low for maintaining average dietary needs in 2030, given today's average of 2,940 calories, and that 73.6% of US adults are currently estimated to have overweight or obesity classifications. Hence, we raised our target to 2,300 calories per day, which is the same level used in a New England Food Vision (see Table 4 and Figures 2-3).

TABLE 3: Healthy U.S.-Style Dietary Pattern for Ages 2 and Older

Calorie Level of Pattern	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200
Food Group or Subgroup	**Daily Amount of Food From Each Group** (Vegetable and protein foods subgroup amounts are per week)											
Vegetables (cup eq/day)	**1**	**1.5**	**1.5**	**2**	**2.5**	**2.5**	**3**	**3**	**3.5**	**3.5**	**4**	**4**
Dark-Green Vegetables (cup eq/wk)	0.5	1	1	1.5	1.5	1.5	2	2	2.5	2.5	2.5	2.5
Red and Orange Vegetables (cup eq/wk)	2.5	3	3	4	5.5	5.5	6	6	7	7	7.5	7.5
Beans, Peas, Lentils (cup eq/wk)	0.5	0.5	0.5	1	1.5	1.5	2	2	2.5	2.5	3	3
Starchy Vegetables (cup eq/wk)	2	3.5	3.5	4	5	5	6	6	7	7	8	8
Other Vegetables (cup eq/wk)	1.5	2.5	2.5	3.5	4	4	5	5	5.5	5.5	7	7
Fruits (cup eq/day)	**1**	**1**	**1.5**	**1.5**	**1.5**	**2**	**2**	**2**	**2**	**2.5**	**2.5**	**2.5**
Grains (cup eq/day)	**3**	**4**	**5**	**5**	**6**	**6**	**7**	**8**	**9**	**10**	**10**	**10**
Whole Grains (ounce eq/day)	1.5	2	2.5	3	3	3	3.5	4	4.5	5	5	5
Refined Grains (ounce eq/day)	1.5	2	2.5	2	3	3	3.5	4	4.5	5	5	5
Dairy (cup eq/day)	**2**	**2.5**	**2.5**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Protein Foods (ounce eq/day)	**2**	**3**	**4**	**5**	**5**	**5.5**	**6**	**6.5**	**6.5**	**7**	**7**	**7**
Meat, Poultry, Eggs (ounce eq/wk)	10	14	19	23	23	26	28	31	31	33	33	33
Seafood (ounce eq/wk)	2-3	4	6	8	8	8	9	10	10	10	10	10
Nuts, Seeds, Soy Prod. (ounce eq/wk)	2	2	3	4	4	5	5	5	5	6	6	6
Oils (grams/day)	**15**	**17**	**17**	**22**	**24**	**27**	**29**	**31**	**34**	**36**	**44**	**51**
Limit on Calories for Other Uses (kcal/day)	**130**	**80**	**90**	**100**	**140**	**240**	**250**	**320**	**350**	**370**	**440**	**580**
Limit on Calories for Other Uses (%/day)	**13%**	**7%**	**6%**	**6%**	**8%**	**12%**	**11%**	**13%**	**13%**	**13%**	**15%**	**18%**

Source: 2020-2025 Dietary Guidelines for Americans

Just as Unchanged Eating marks one end of a spectrum of possibility for 2030, Resilient Eating marks the other end (Figure 2). It takes shape by closely following the USDA DGA recommendations for a 2,300 kcal per day dietary pattern. Nearly all food group and sub-group servings are the same as the DGA recommendations, with the exception of a few key differences, explained below.

- **Vegetable Consumption:** Our recommendation is to increase vegetable consumption to 3 cups a day—a 56% increase from today. The largest increases would fall in "Red Orange" (e.g., tomatoes, carrots, sweet potatoes, winter squash), and in "Other" (e.g., cucumbers, eggplants, green beans), both of which would more than double. Dry beans would only need to increase slightly to meet vegetable recommendations, but more beans could also be consumed as protein.

- **Fruit Consumption:** Our recommendation is to increase fruit consumption to 2 cups a day—nearly doubling what the average person eats today. This increase should come as much as possible from whole fruit without added sugars, which is more nutrient-dense and contains more fiber than juice.

- **Grain Consumption:** Our recommendation is that grain consumption would be virtually unchanged. However, a significant increase in whole grain would be desirable, as USDA recommends that half of grain consumption be whole grain.

- **Dairy Product Consumption:** The Resilient Eating scenario maintains dairy consumption at current average intake levels of 1.5 cup equivalents per day; whereas the DGAs recommends 3 cup equivalents of dairy products. Consumption of 1-2 cups per day is consistent with the recommendation of many nutritionists, for example, Harvard's Healthy Eating Plate. Our choice of 1.5 cups was reviewed and supported by a panel of nutrition experts (see page 14).

- **Protein Consumption:** Resilient Eating follows the DGAs and sets average protein consumption at 6.5 ounce equivalents a day (or 43.75 oz/week), a 23% reduction from Unchanged Eating. We also followed the DGA in reducing the meat, poultry, and eggs portion of protein intake to 4.2 oz/day (29.5 oz/week), a 37% decrease. We subdivided that portion in the following way:

    - 4 oz/week of eggs (≈2 large eggs, about the same as today);
    - 14 oz/week of poultry (about the same as today);
    - 6.5 oz/week of beef, veal, lamb, and goat (much less than today); and
    - 5 oz/week of pork (less than today).

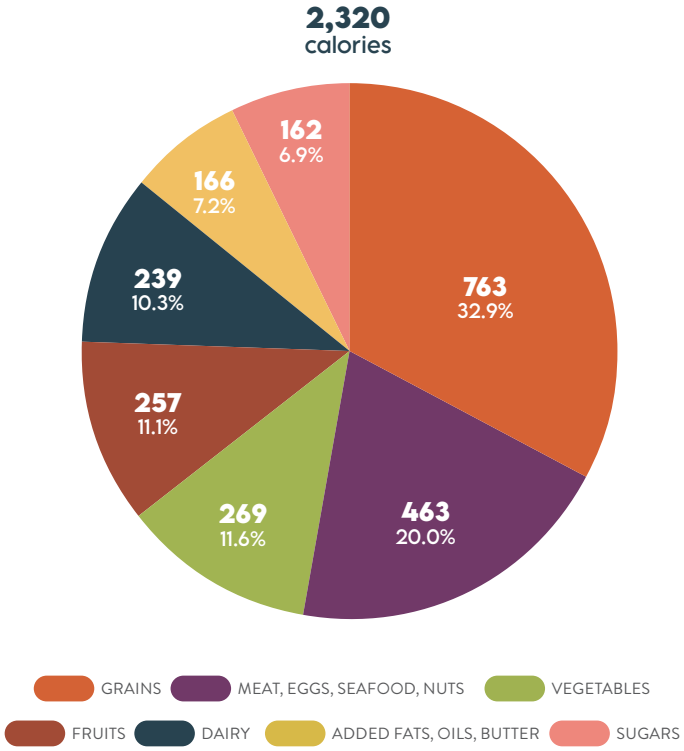
The DGAs recommend that the average American consume roughly 1.35 ounces of seafood daily, or 9.5 ounces per week. This more than tripling of current seafood intake struck us as nutritionally desirable, but practically unattainable—and we wondered whether it is a level the world's oceans and aquaculture could sustainably supply. Instead, for the Resilient Eating scenario we set seafood consumption equal to our Production team's estimate of sustainable production for the region—3.5 ounces per week, or 0.5 ounces daily. That would be a 18% increase from current levels of consumption. Again, the panel of nutrition experts supported this more cautious approach.

A combination of nuts, soy, and beans amounting to 10.75 ounces per week (or roughly 1.54 ounces daily) would fulfill the remaining protein requirement. This would represent a 21% increase from what is consumed today. By contrast, for reasons that are not clear to us, the DGAs recommendation for these plant protein sources is only 0.71 ounces daily, an actual decrease from current consumption. This belies the steady upward trend in nuts, beans, and soy in recent years.

- **Added Fats and Oils Consumption:** The Resilient Eating scenario, following the DGAs, would reduce consumption of fats and oils to 30 grams a day—half of what it is now.

- **Sweetener and Alcohol Consumption:** That would leave room in the Resilient Eating diet pattern for about 161 additional calories from sweeteners and alcohol—as compared to an average of about 519 calories from sugar (363 calories) and from alcohol (157 calories) that are consumed today.

FIGURE 2: Resilient Eating Dietary Pattern



Ironically, some elements of Resilient Eating (i.e., eating closer to the dietary guidelines), such as increased consumption of fruits and vegetables, would make it *more* challenging to achieve increased regional self-reliance in the production of those foods since production would have to dramatically increase. Yet, in spite of that relative decline in self-reliance, both increased consumption and increased production of such foods within the region would mark *absolute* improvements in resilience as people ate more healthfully.

Some elements of Resilient Eating, in particular reducing red meat consumption and increasing nuts and beans, are more environmentally beneficial as well. They can help reduce greenhouse gas emissions and other environmental impacts. This will be especially true if combined with sustainable production methods within the region, such as increased grassland production (which can reduce nutrient runoff and build soil carbon), and restrained, diverse fishing across the entire ecosystem of available species.

Photo credit: Champlain Orchards

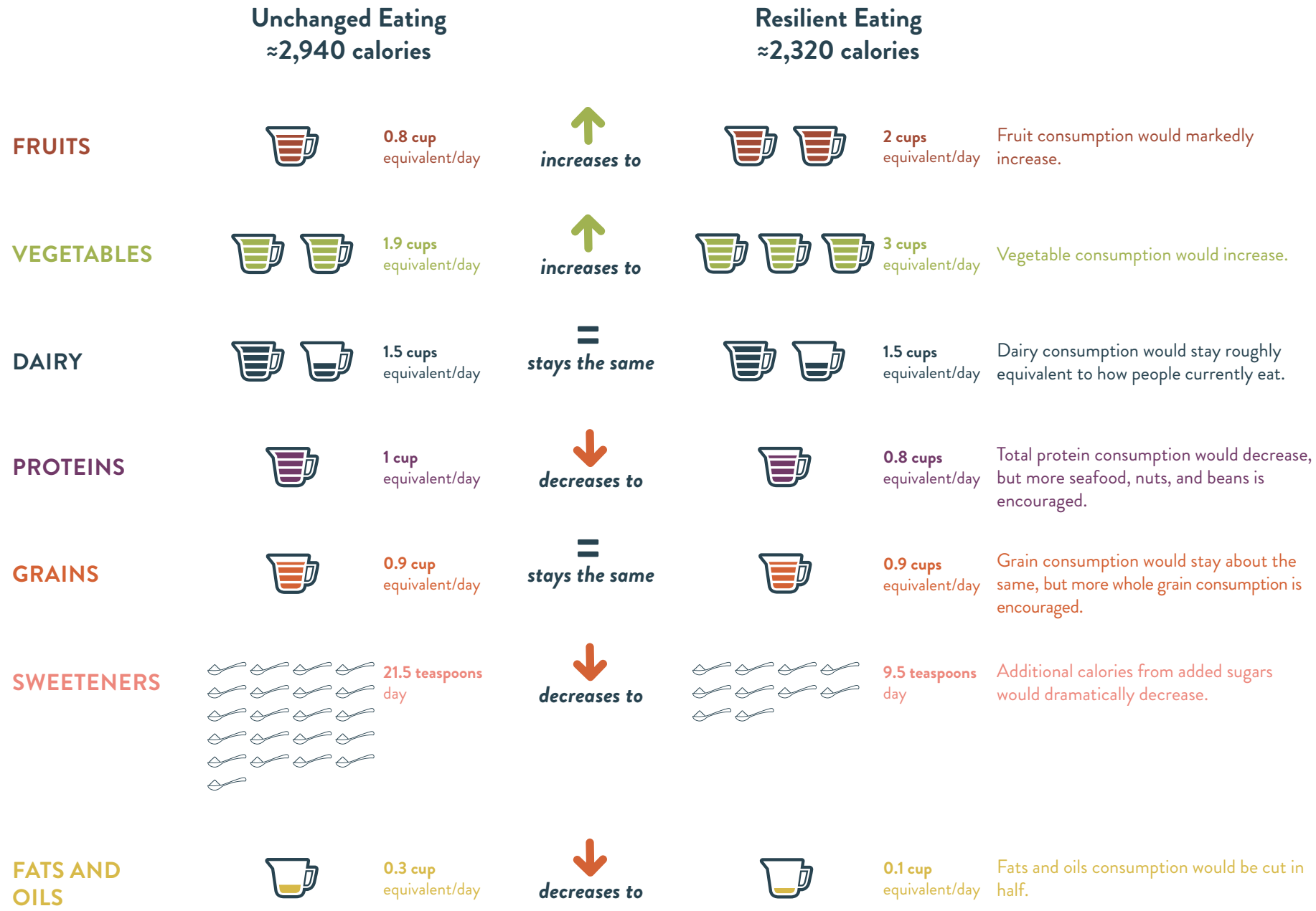
Ironically, eating in a healthier way, with much more fruits and vegetables (i.e., closer to dietary guidelines), makes it more challenging to increase regional self-reliance.

TABLE 4: Comparing the Unchanged Eating and Resilient Eating Scenarios

Food Group	Units	Unchanged Eating (2,940 kcal)	DGAs (2,300 kcal)	Resilient Eating (2,300 kcal)	Serving Size Difference Between Unchanged and Resilient	Percent Difference Between Unchanged and Resilient
Vegetables	cup equiv/day	**1.918**	**3**	**3**	**1.08**	**56%**
Starchy	cup equiv/day	0.666	0.857	0.857	0.19	29%
Red/Orange	cup equiv/day	0.439	0.857	0.857	0.42	95%
Other	cup equiv/day	0.310	0.714	0.714	0.40	130%
Dark Green	cup equiv/day	0.247	0.286	0.286	0.04	16%
Beans	cup equiv/day	0.256	0.286	0.286	0.03	12%
Fruit	cup equiv/day	**0.817**	**2**	**2**	**1.18**	**44%**
Grain	ounce equiv/day	**7.193**	**7.5**	**7.5**	**0.31**	**4%**
Dairy	cup equiv/day	**1.488**	**3**	**1.5***	**0.01**	**1%**
Protein	ounce equiv/day	**8.099**	**6.25**	**6.25**	**-1.85**	**-23%**
Meat/Poultry/ Eggs	ounce equiv/day	6.658	4.21	4.21	-2.44	**-37%**
Seafood	ounce equiv/day	0.424	1.36	0.5*	0.08	18%
Nuts, Soy, and Beans (Plant-based Protein)	ounce equiv/day	1.273	0.71	1.54*	0.26	21%
Fats and Oils	fat grams	**64.06**	**30**	**30**	**-34.06**	**-53%**
Additional Calories *(Sweeteners, Alcohol)*	calories	**519**	**276**	**161***	**-358.00**	**-69%**

* Differs from DGAs

FIGURE 3: Estimates of Shifts in Servings Required to Move From Unchanged Eating to Resilient Eating in 2030



Focus Group with Food and Nutrition Experts

After constructing a preliminary version of Resilient Eating, we convened a panel of food and nutrition experts for a semi-structured virtual focus group. The overarching goal was to get their reaction to our two dietary patterns. We focused the discussion on four topics: (1) our comparison of LAFA to NHANES data; (2) the caloric target we used to construct the "Resilient Eating" diet; (3) places where we deviated from the 2020-2025 Dietary Guidelines for Americans; and (4) the cultural appropriateness of "Resilient Eating" for meeting racially and ethnically diverse audiences.

The 90-minute Zoom focus group was facilitated by members of the NEFNE research team in May, 2022. Overall, 23 experts from primarily New England universities, including faculty and program staff, were recruited. Seven consented to participate (30% response rate) with regional representation from New Hampshire, Connecticut, Rhode Island, Vermont, Massachusetts, and one from California. Their expertise spanned dietetics, race and equity, environmental factors impacting food choices, dietary assessment, food and nutrition security, and food system resilience. The focus group was audio-recorded with in-depth notes collected. To promote accuracy with interpretation of participant feedback, we completed member checking at the culmination of the interview.[7] The research team then met to further discuss these takeaways, and to make revisions based on the panel's recommendations.

The panel supported our decision to use LAFA data to characterize current consumption. However, the experts felt strongly that the calorie target for the Resilient Eating pattern needed to increase from 2,100 calories to at least 2,300, to better align with average consumption patterns today. The panel felt that our proposed Resilient Eating deviations from the DGA in the dairy and protein food groups were reasonable.

Lastly, the experts impressed upon us the need to ensure that the Resilient Diet is relevant to racially and ethnically diverse audiences and can fit within any food budget. They stressed the importance of ensuring that no community perceives barriers to integrating culturally diverse and economical foods into these diets.

3 Resilient Eating Across New England in 2030

Resilient Eating by Food Group

This section examines long-term trends of changing consumption within the food groups in the context of Resilient Eating goals. Understanding the trends is revealing as we consider how to achieve greater food system resilience. The data are drawn from USDA ERS Food Availability (Per Capita) Data System, which is ***inclusive of processed and manufactured food.*** The period over which consistent data are available varies among different types of food. For example, vegetable trends were available from 1997 to 2019, while wheat trends are available from 1970 to 2020. The major trends are shown to 2019 or 2020, then projected forward as a straight dashed line to 2030, with the shaded areas around the line showing the likely bounds of variation based on the degree of fluctuation in previous years.

Challenges to Achieving Resilient Eating Patterns

Meeting a goal of 30% regional food self-reliance will require significant cultural change in how and what we eat, and major investments in improving access to healthy food.

- **We have made limited progress in reducing diet-related health problems:** Poor diet is the leading risk factor of illness and death in the United States.[8] The amount of food we eat and the composition of ingredients in our food have changed: ultra-processed foods—high in sugar, fat, sodium, and artificial flavors—comprise an estimated 58% of caloric intake in the United States.[9]

- **We have made limited progress reducing food insecurity:** Black, Hispanic, Indigenous, and other communities of color are unfairly burdened with food insecurity and low food access. For example, the USDA Food Access Research Atlas identifies "low income/low access" (LILA) census tracts where a large proportion of the residents have low-incomes and are more than 1/2 mile from a food source for urban populations. Although White New Englanders make up 71.3% of the region's population, only 15.2% of White people live in LILA census tracts. Every other category—Hispanic, Black, Asian, Indigenous, Native Hawaiian/Pacific Islander, two or more races, some "other" race—make up 28.7% of New England's population, but **45.9% of its population living in LILA census tracts.**

  See *Common Food System Challenges Backgrounder* for more information.

Vegetables

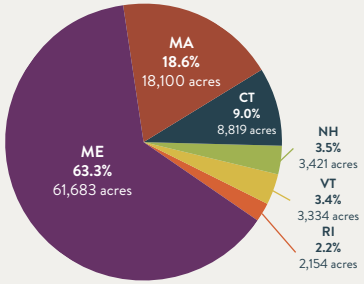
Total vegetable consumption decreased 11.5% from 1997 to 2011, before it rebounded to 1997 levels—just below 2 cups per day—by 2019 (Figure 4). The overall vegetable consumption trend conceals a significant increase in dry bean, pea, and lentil consumption (i.e., legumes) since 2015, as compared to a long-term decline in starchy vegetables such as potatoes and sweet corn (the two *most common* vegetables grown in New England). Still, potatoes remain the most commonly consumed vegetable across fresh, frozen, and processed categories including chips and fries, accounting for over 30% of vegetable consumption in the United States.

To reach vegetable intake recommendations, average consumption would need to reach 3 cups a day—a 60% increase from today. This goal is unlikely to be achieved without targeted action based on how far outside the confidence bounds it lies. Additionally, the New England states would need to significantly ramp up production of crops other than potatoes, sweet corn, pumpkins, squash, and snap beans.

2017 New England Vegetable Acreage: 97,511 acres

Maine accounts for the majority of vegetable acreage in New England.

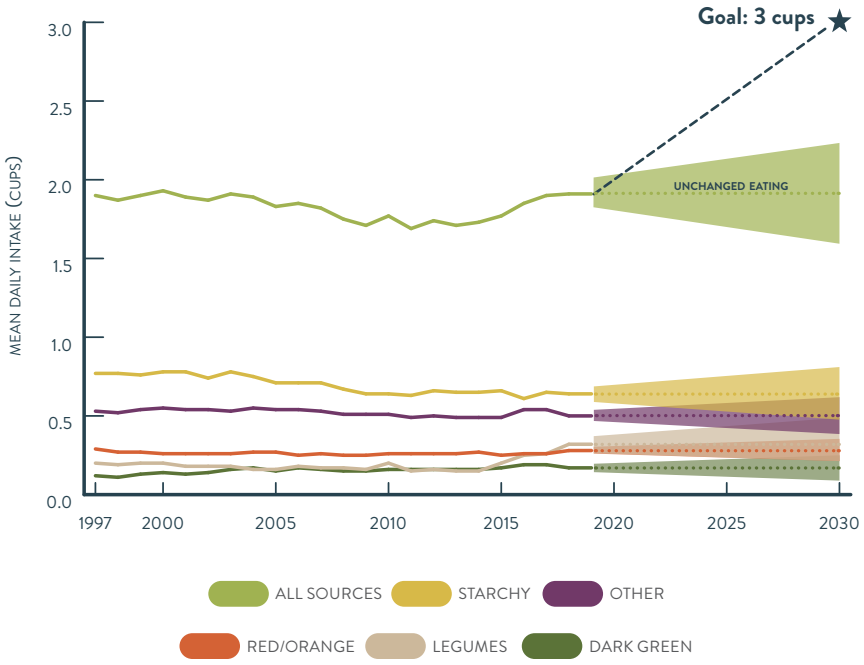
Potatoes account for about **55%** of New England vegetable acreage, followed by sweet corn, pumpkins, squash, and snap beans.



Meeting a 30% by 2030 goal would require an additional **138,000 acres** devoted to vegetables.

Source: 2017 USDA Census of Agriculture

FIGURE 4: Vegetable Intake by Type



Product Examples	1997	2019	% Change
All Sources	1.90 cups	1.91 cups	+0.2%
Starchy: potatoes, sweet potatoes, corn, green peas, jicama, lima beans, plantains, burdock root, breadfruit, squash, beets, turnips.	0.77 cups	0.64 cups	-16.7%
Red/Orange: carrots, bell peppers, pumpkin, tomatoes.	0.29 cups	0.28 cups	-2.2%
Legumes: chickpeas, edamame, lentils, beans, soy nuts, split peas.	0.20 cups	0.32 cups	+60.9%
Dark Green: broccoli, lettuce, spinach, bok choy, watercress, kale, collards, chard.	0.12 cups	0.17 cups	+42.5%
Other: asparagus, avocado, bamboo shoots, Brussels sprouts, cabbage, nopales, cauliflower, celery, cucumber, eggplant, green beans, seaweed, tomatillos.	0.53 cups	0.50 cups	-5.7%

Fruits

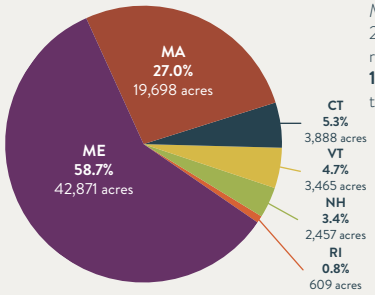
Fruit consumption overall has declined slightly since 1992 (Figure 5). This is almost entirely because of a decline in juice, together with a smaller drop in canned fruit. Whole, fresh fruit consumption has increased slightly, roughly 10% over the past decade. Today, fresh bananas and apples comprise over 25% of all fruit consumption, while orange and apple juice comprise over one-fifth. However, fruit consumption remains less than half of what the DGAs recommend for adults.

Fruit consumption would need to increase to 2 cups a day—more than doubling what the average person eats today. This goal is unlikely to be achieved without targeted action based on how far outside the confidence bounds it lies. This increase should come as much as possible from whole fruit, which is more nutrient-dense and contains more fiber than juice. The New England states would need to significantly ramp up production of crops other than blueberries and cranberries.

2017 New England Fruit Acreage: 72,985 acres

Maine accounts for the majority of fruit and berry acreage in New England.

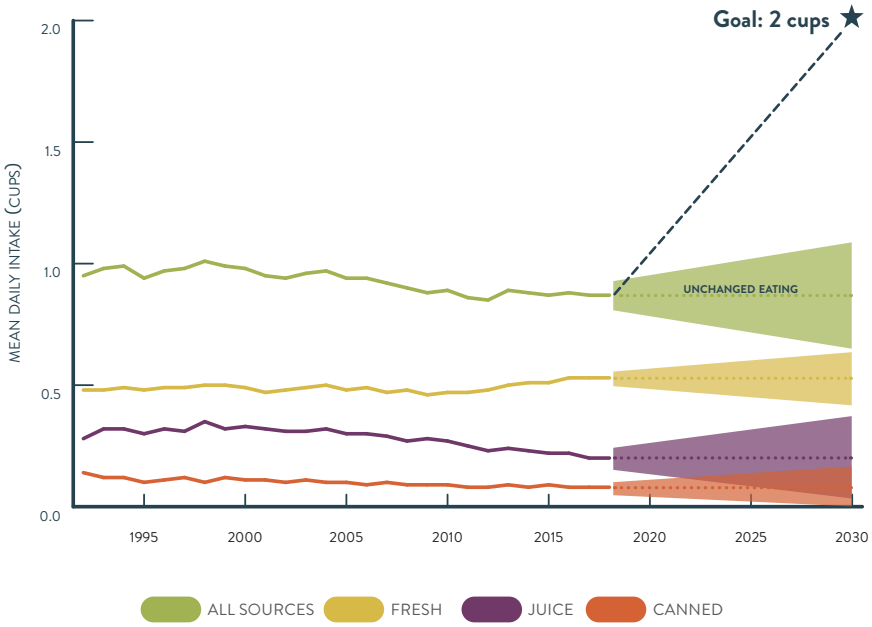
Berries—mostly blueberries and cranberries—account for about **78%** of total fruit and berry acreage. Fruits, mostly apples, account for about **22%** of fruit and berry acreage.



Meeting a 30% by 2030 goal would require an additional **113,000 acres** devoted to fruits and berries.

Source: 2017 USDA Census of Agriculture

FIGURE 5: Fruit Intake by Type



Product Examples	1992	2018	% Change
All Sources	0.95 cups	0.87 cups	+0.2%
Fresh Fruit	0.48 cups	0.53 cups	+9.0%
Fruit Juice	0.28 cups	0.20 cups	-25.8%
Canned Fruit	0.14 cups	0.08 cups	-41.2%
Dried Fruit (not shown on figure)	0.04 cups	0.03 cups	-15.0%
Frozen Fruit (not shown on figure)	0.02 cups	0.02 cups	+24.5%

All fresh, juiced, canned, dried, and frozen fruits includes apples, bananas, berries, kiwifruit, citrus fruit (e.g., oranges), cherries, dates, figs, grapes, guavas, jackfruit, lychee, mangoes, melons, nectarines, papaya, peaches, pears, persimmons, pineapples, plums, pomegranates, raisins, rhubarb, sapote, soursop, and more.

Grains

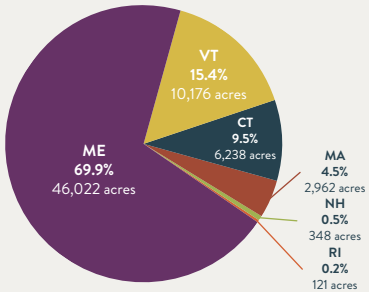
Trends in grain consumption are somewhat obscured by lack of data on rice beyond 2010 (Figure 6). However, even if rice has seen a significant change this probably would not have a major impact on overall grain consumption. Overall, grains appear to have risen until the year 2000, and stayed fairly flat since then—a slight decline in wheat consumption matches a slight rise in corn.

Under the Resilient Eating scenario, grain consumption would be virtually unchanged. However, a significant increase in whole grain would be desirable, as USDA recommends that half of grain consumption be from whole grains. This recommendation is inside the likely bounds of variation based on the degree of fluctuation in previous years. The six New England states had about 66,000 acres in grains in 2017, mostly corn, oats, and barley, with much lower amounts of rye and wheat, and grain production is one of the categories where New England has very low regional self-reliance.

2017 New England Grain Acreage: 65,867 acres

Maine accounts for the majority of New England grain acreage.

Corn (38%), oats (33%) and barley (23%) account for the majority of grain acreage in New England.

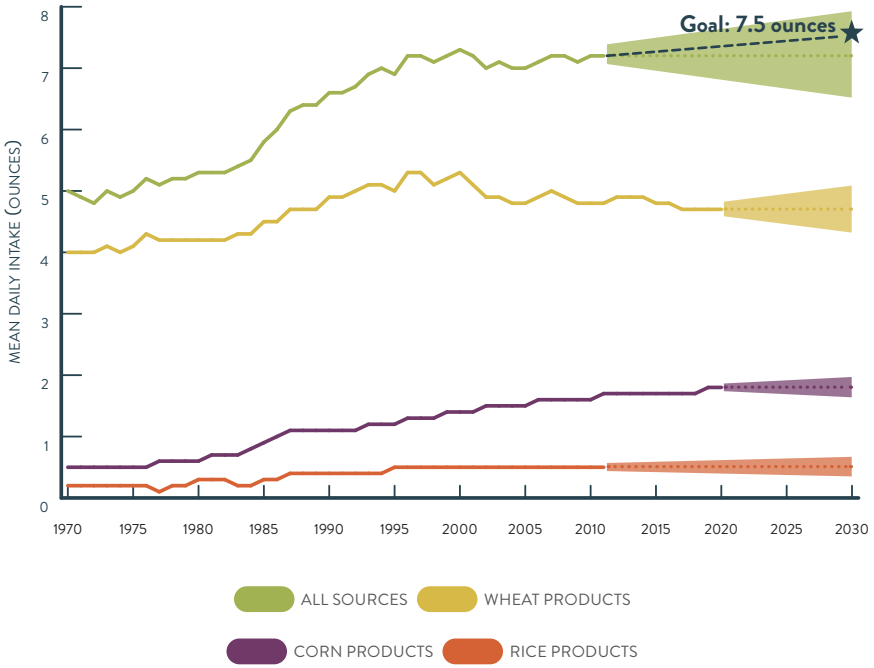


Meeting a 30% by 2030 goal would require an additional **96,000 acres** devoted to grains.

Source: 2017 USDA Census of Agriculture

Note: This estimate includes the *reported value* of acres devoted to each grain crop. It does not reflect the *grain utilization percentage* used to calculate New England's grain acreage—30,426 acres—in Volume 2.

FIGURE 6: Grain Intake by Type



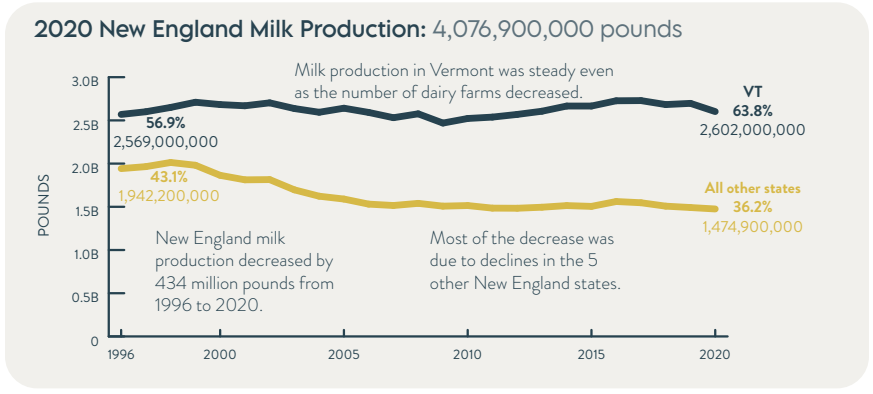
Product Examples	1970	2011	% Change
All Sources	5.0 ounces	7.2 ounces	+44.0%
Rice Products	0.2 ounces	0.5 ounces	+164.1%

Product Examples	1970	2020	% Change
Wheat Products	4.0 ounces	4.7 ounces	+17.6%
Corn Products	0.5 ounces	1.8 ounces	+224.5%
Oat, Rye, and Barley Products (not shown on figure)	0.22 ounces	0.18 ounces	-20.2%

Dairy Products

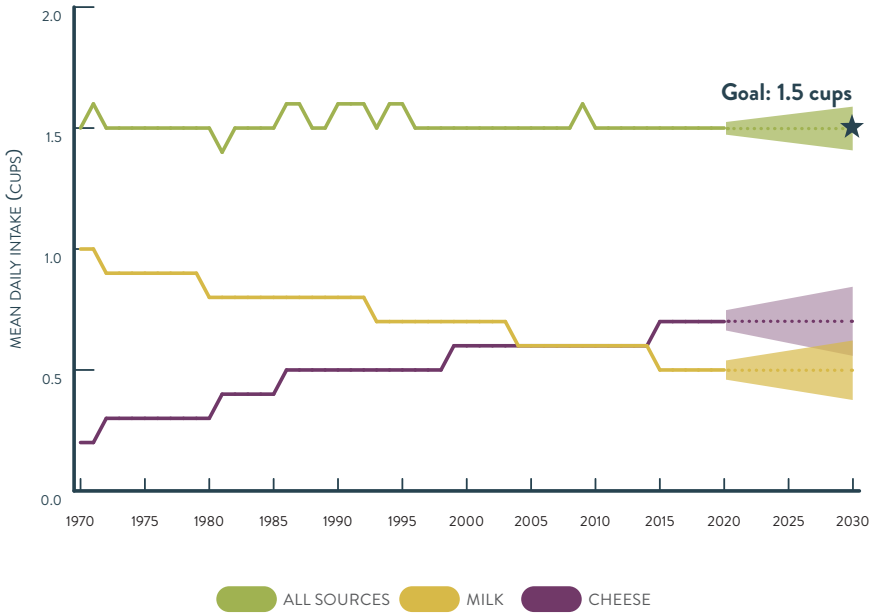
Dairy consumption overall has been nearly flat since 1970 at 1.5 cups (Figure 7). However, this conceals a steady decline in fluid milk, matched by a dramatic rise in cheese. Fluid milk has fallen from nearly two-thirds to just under one-third of dairy consumption in 2019, while cheese has risen to about one-half of all the dairy products we eat. Americans are consuming less milk as a drink and less milk in cereal, but it is not entirely clear why fluid milk consumption has decreased. Research indicates that competition between milk and other beverages, like soda, has had little impact on milk purchases. On the other hand, consumption of plant-based alternatives, like oat and almond beverage, does compete with dairy milk, but the increase in alternative milk sales (not shown in Figure 6) is much less than the decrease in dairy milk sales.[10]

The Resilient Eating scenario maintains dairy consumption at current average intake levels of 1.5 cup equivalents per day. Although New England has relatively high regional self-reliance for dairy products, overall milk production in New England has decreased.



Source: USDA NASS New England Agricultural Statistics

FIGURE 7: Dairy Intake by Type



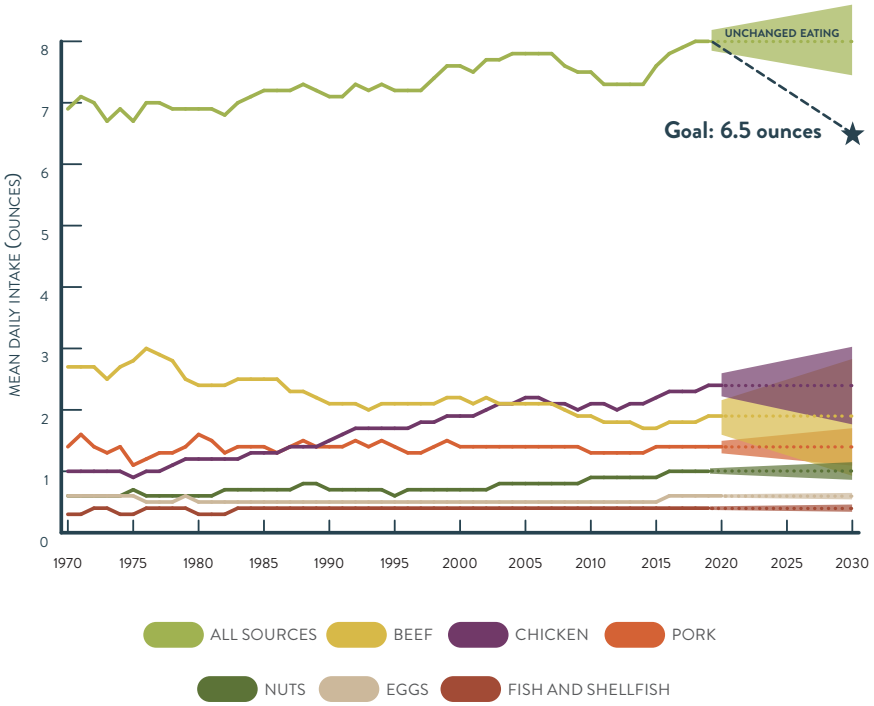
Product Examples	1970	2011	% Change
All Sources	1.55 cups	1.49 cups	-3.9%
Milk	1.0 cups	0.5 cups	-48.6%
Cheese	0.2 cups	0.7 cups	+212.8%
Frozen Dairy (not shown on figure)	0.11 cups	0.09 cups	-16.8%
Yogurt (not shown on figure)	0.003 cups	0.05 cups	+1,513.2%
Other (not shown on figure)	0.25 cups	0.13 cups	-45.6%

Proteins

Protein consumption—including all forms of animal meat, seafood, and nuts—has increased slightly overall since 1970 (Figure 8). A small, but significant, increase in nuts is part of this, but the biggest change is the more-than-doubling in consumption of chicken, overtaking beef just after 2000. By contrast, beef consumption has seen a long decline, though this appears to have bottomed out and increased slightly since 2014.

The Resilient Eating scenario suggests reducing protein consumption from around 8 ounces per day to 6.5 ounces. This goal is unlikely to be achieved without targeted action based on how far outside the confidence bounds it lies. Vermont and Maine have significant amounts of forage/hay acreage, but cattle (beef) and hog (pork) production has decreased over the past 20 years. Poultry and egg production data for the New England states was not available after 2012.

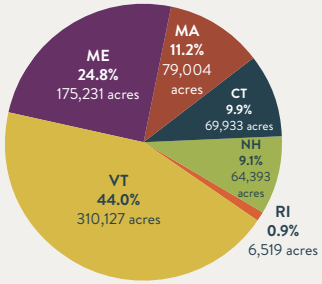
FIGURE 8: Protein Intake by Type



Product Examples	1970	2019	% Change
All Sources	6.9 ounces	8.0 ounces	+14.7%
Nuts	0.6 ounces	1.0 ounces	68.7%
Fish and Shellfish	0.3 ounces	0.4 ounces	28.6%
Product Examples	**1970**	**2020**	**% Change**
Beef	2.7 ounces	1.9 ounces	-30.8%
Chicken	1.0 ounces	2.4 ounces	+143.9%
Pork	1.44 ounces	1.45 ounces	+0.3%
Eggs	0.62 ounces	1.59 ounces	-4.7%

2017 New England Forage/Hay Acreage: 705,207 acres

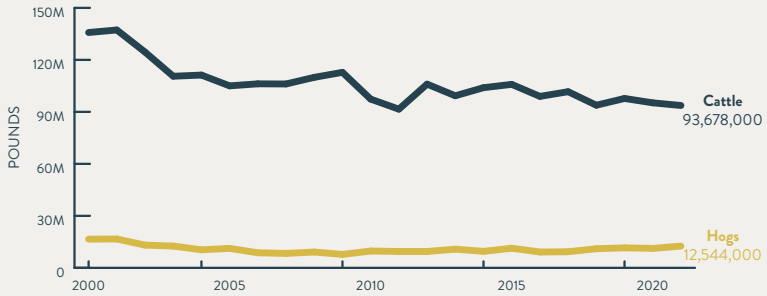
Vermont accounts for the majority of forage/hay acreage.



Meeting a 30% by 2030 goal would require an additional **176,000 acres** devoted to forage/hay.

Source: 2017 USDA Census of Agriculture

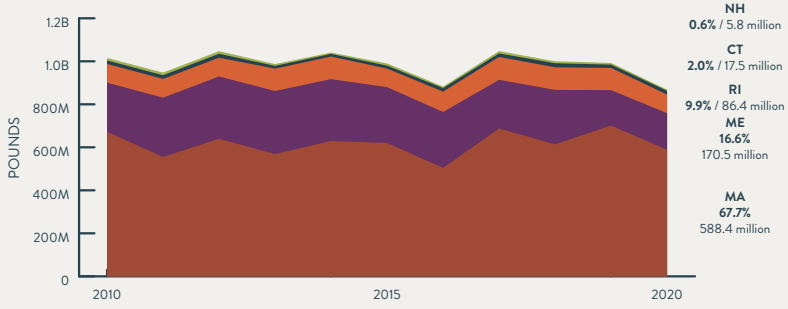
2021 New England Cattle and Hog Production: 106,222,000 pounds



Source: USDA NASS New England Agricultural Statistics

The five New England states with coastlines landed over a billion pounds of seafood in 2020. Massachusetts accounts for the lion's share of seafood landings: 67.7%. The Resilient Eating scenario set seafood consumption equal to our Production Team's estimate of sustainable production for the region—3.5 ounces per week, or 0.5 ounces daily.

2020 New England Seafood Production: 1,015,470,094 pounds



Source: NOAA Fisheries Commercial Landings

Photo credit: Ink + Light Creative

Hog production, seen here at Windmist Farm in Jamestown, Rhode Island, has been flat in New England over the past 20 years.

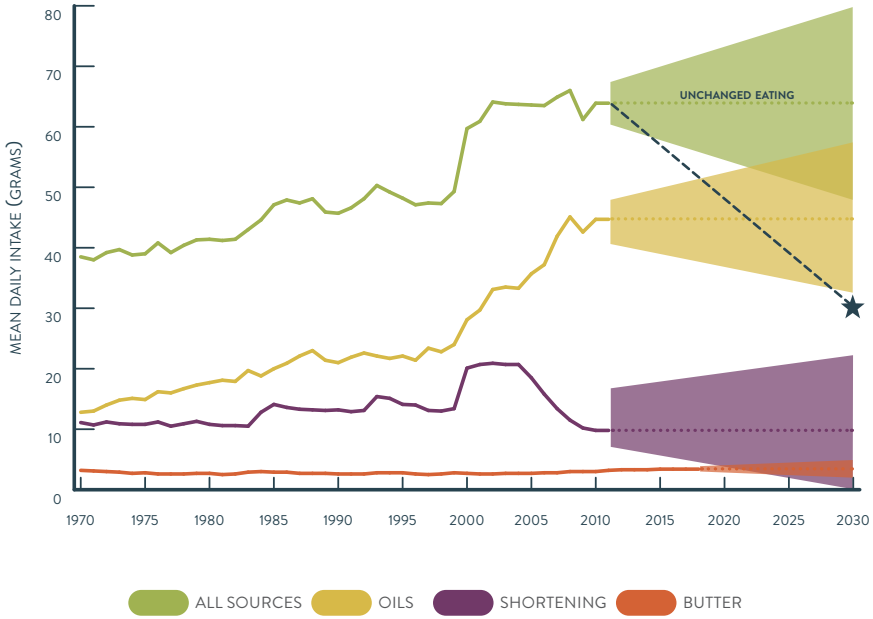
Fats and Oils

Unfortunately, there are no data past 2010 on consumption of vegetable and cooking oils, which comprise most intake of fats and oils (Figure 9). Dairy fats, led by butter, have experienced slight rises through 2017, but they presumably still constitute only a small part of overall fat intake. Globally, production of palm, soybean, rapeseed (canola), sunflower, and other types of vegetable oil in the food supply has dramatically increased.

The Resilient Eating scenario, following the DGAs, would reduce consumption of added fats and oils to 30 grams a day—half of what it is now. This goal is unlikely to be achieved without targeted action based on how far outside the confidence bounds it lies.

The six New England states grow a neglible amount of soybeans, canola, sunflowers, and other crops for oil. For example, in 2017, Vermont had 4,800 acres of soybeans and Massachusetts had 317 acres. In 2021, the top two butter producing states—California and Pennsylvania—accounted for 37% of US butter production. Western states accounted for 53% of US butter production, while Atlantic region states accounted for 8% of butter production. New England's top dairy state, Vermont, has seven licensed butter makers.[9] Fats and oils is one of the categories where New England has very low regional self-reliance and we likely will continue to depend on imports of fats, particularly healthier mono-unsaturated and polyunsaturated fats, such as those found in plant oils versus butter.

FIGURE 9: Added Fats and Oils Intake by Type



Product Examples	1970	2011	% Change
All Sources	38.5 grams	63.9 grams	+66.1%
Oils	12.8 grams	44.7 grams	+248.4%
Shortening	11.1 grams	9.8 grams	-11.7%
Margarine (not shown on figure)	6.5 grams	1.6 grams	-75.5%
Other (not shown on figure)	2.0 grams	1.5 grams	-27.3%
Lard (not shown on figure)	1.8 grams	0.6 grams	-65.4%
Product Examples	**1970**	**2018**	**% Change**
Butter	3.2 grams	3.4 grams	+6.2%

Sweeteners

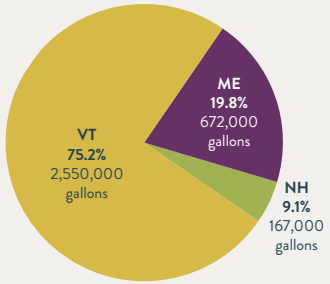
Overall consumption of sweeteners peaked in 1999, and has been declining since then, but is still higher than it was in 1970 (Figure 10). High fructose corn syrup was first marketed in the 1970s and experienced rapid growth before peaking in 2000. The consumption decline in high fructose corn syrup has been attributed to consumer awareness of excessive sugar consumption, sugar reduction in manufactured food and beverage products, increased use of sugar substitutes, and increased use of corn for ethanol.[11] Consumption of cane and beet sugar steadily decreased as the use of high fructose corn syrup increased, but that trend has flattened out. Edible syrups, including maple syrup, comprise only about 1% of sweetener consumption. Honey intake has increased, but also accounts for only about 1% of all added sugar consumption.

The reduction in added sweeteners recommended in the Resilient Eating scenario is unlikely to be achieved without targeted action based on how far outside the confidence bounds it lies.

2022 New England Maple Syrup Production: 3,389,000 gallons

Vermont is the top maple syrup producer in the country.

Maple syrup production is already being impacted by climate change, and the concern is that warming temperatures will lead to decreased production.

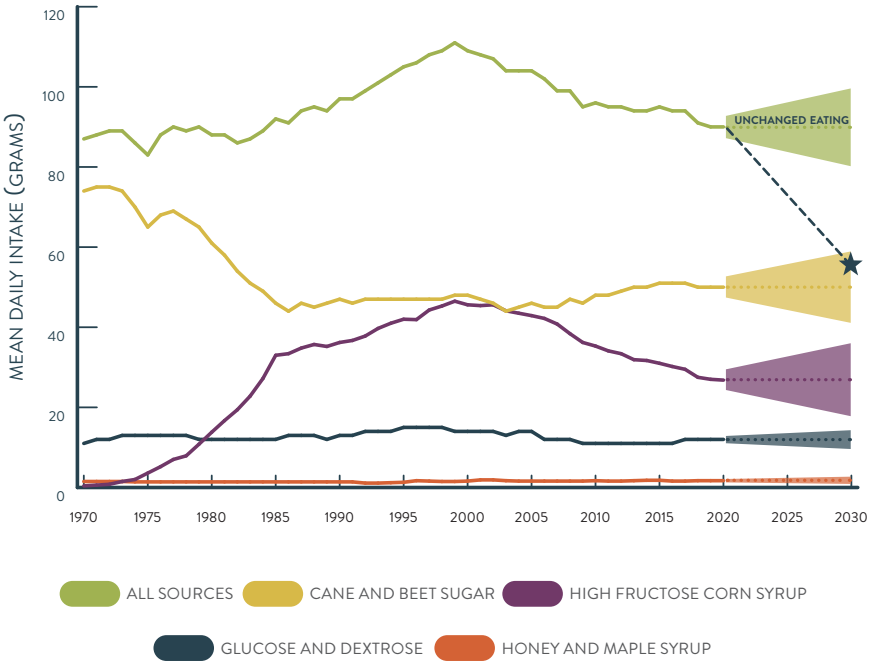


2021 New England Honey Production: 58,584 gallons

Honey production data for the four other New England states was not available.

Source: USDA NASS New England Agricultural Statistics

FIGURE 10: Added Sweeteners Intake by Type



Product Examples	1970	2020	% Change
All Sources	87 grams	90 grams	+3.5%
Cane and Beet Sugar	74 grams	50 grams	-32.8%
High Fructose Corn Syrup	0.4 grams	26.8 grams	+6,595.0%
Glucose and Dextrose	11.2 grams	11.7 grams	+4.5%
Honey, Maple Syrup	1.37 grams	1.92 grams	+40.1%

New Englanders could certainly consume more regional maple syrup and honey, but most of the added sugar we consume is already mixed into processed/manufactured food and beverage products.

Alcohol

Nationally, alcohol consumption was found to account for roughly 150 calories per day in 2019—about one and a third drinks per person over age 14. Consumption has declined sharply since about 1980, and then increased somewhat. The average American was drinking roughly 10% more in 2019 than in 1995, but still nearly 15% less than the average American in 1980. Beer has been declining since that peak (although it still leads consumption); whereas spirits and wine have been rebounding since 1995. Alcohol consumption is generally similar in all regions of the country, running slightly higher than the "Healthy People 2020 Target" of 1.25 drinks per day.

The six New England states have developed a strong reputation for the quality of their beer and spirits but, as a practical matter, a very modest amount of ingredients (e.g., hops) are produced regionally.

Photo credit: Ink + Light Creative

The six New England states have a strong reputation for beer production, but a very modest amount of ingredients are produced regionally. Pictured: Throwback Brewery in North Hampton, New Hampshire.

4 The True Cost of Resilient Eating

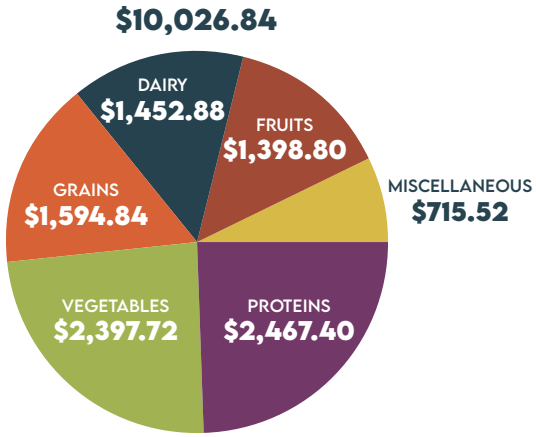
How much would it cost to eat more resiliently, compared to the way the average New Englander eats today?

This is a complex question that cannot have a precise answer. We can think of Resilient Eating differing from how we eat today in two important ways: 1) the cost of eating a healthier diet; 2) the cost of eating a more sustainably and justly-produced diet, with a larger proportion coming from local and regional sources. We must also consider the challenges that resource-constrained and food insecure New Englanders face. Ultimately, Resilient Eating may cost somewhat more, but we need to consider the benefits of Resilient Eating as well.

We can get some sense of the cost of eating a healthier diet by comparing three data sets: USDA Healthy Food Plans, the Bureau of Labor Statistics Consumer Expenditure Survey, and Resilient Eating (the healthier dietary pattern recommended in this Volume). Because Resilient Eating and the USDA Healthy Food Plans both closely follow the USDA dietary guidelines (with some important differences), the costs associated with those food plans provide a reasonable proxy for the cost of Resilient Eating.

As a practical matter, "across all income levels, eating patterns in the United States are nowhere near alignment with the *Dietary Guidelines for Americans*." The USDA has long prepared four food plans that meet dietary guidelines at ascending cost levels: Thrifty, Low-cost, Moderate, and Liberal. **The Thrifty Food Plan (TFP) is the lowest cost of the four plans. It was developed to demonstrate that healthy, nutrient-dense foods can be purchased by resource-constrained households.** The 2021 TFP would cost a family of four about $10,000 per year ($835.57 per month, Figure 11).

FIGURE 11: Thrifty Food Plan Annual Expenditures



Source: USDA Food and Nutrition Service, August 2021, Thrifty Food Plan, 2021.

In 2021, the TFP was given a long-needed update, based on contemporary food consumption patterns, costs, and dietary guidance. This is important because levels of Supplemental Nutrition Assistance Program (SNAP) benefits are set by the TFP, and the update resulted in about a *20%* increase in SNAP benefits—a widely-hailed improvement in food security (Table 5).

TABLE 5: Estimated Increase in SNAP Benefits, Fiscal Year 2022

State	Under Prior TFP	Under Re-evaluated TFP	Difference
Connecticut	$666,000,000	$847,000,000	$181,000,000
Maine	$244,000,000	$311,000,000	$67,000,000
Massachusetts	$1,572,000,000	$2,000,000,000	$428,000,000
New Hampshire	$102,000,000	$130,000,000	$28,000,000
Rhode Island	$255,000,000	$325,000,000	$70,000,000
Vermont	$115,000,000	$146,000,000	$31,000,000
New England	$2,954,000,000	$3,759,000,000	$805,000,000

Source: USDA Food and Nutrition Service, Estimated Increase in SNAP Benefits - FY 2022, https://www.fns.usda.gov/TFP/state_table.

The detailed update of the TFP provides an opportunity to compare these recommended food expenditures to *actual* at-home expenditures for average Americans, published by the Consumer Expenditure Survey (CES). The CES provides estimates of average expenditures for U.S. consumers across a variety of products and services and provides results by income, race, ethnicity, age, geography, and other demographic variables. Note that the TFP is calculated for a family of *four*, while the CES uses a smaller household size of *2.5*. That is why the TFP value of $10,000 appears like a lot compared to CES data of $7,316 for the average household — it's for a larger family of 4.

Across all quintiles and other demographic variables, housing (35% of total expenditures) and transportation (16%) were the top expenditures, followed by food at $7,316 (12%). In 2020, food purchased for consumption at home accounted for 67% ($4,942) of expenditures

TABLE 6: 2020 Consumer Expenditure Survey Results by Quintiles of Income Before Taxes

Item	All	Lowest 20%	Second 20%	Third 20%	Fourth 20%	Highest 20%
Income Before Taxes	$84,352	$13,219	$34,550	$59,422	$97,221	$218,191
Average Ann. Expenditures	$61,334	$28,724	$39,890	$51,543	$71,942	$114,840
Food	$7,316	$4,099	$5,399	$6,300	$8,532	$12,245
Food at Home	$4,942	$3,099	$3,820	$4,230	$5,736	$7,817
% of Food	67.5%	75.6%	70.7%	67.1%	67.2%	63.8%
Vegetables	$503	$320	$394	$424	$572	$803
% of Food at Home	*10.2%*	*10.3%*	*10.3%*	*10.0%*	*9.9%*	*10.3%*
Fruits	$474	$302	$373	$413	$535	$746
% of Food at Home	*9.6%*	*9.7%*	*9.8%*	*9.8%*	*9.3%*	*9.5%*
Grains	$640	$425	$486	$543	$756	$988
% of Food at Home	*12.9%*	*13.7%*	*12.7%*	*12.8%*	*13.2%*	*12.6%*
Dairy	$474	$303	$353	$410	$577	$725
% of Food at Home	*9.6%*	*9.8%*	*9.2%*	*9.7%*	*10.1%*	*9.3%*
Proteins	$1,075	$669	$856	$944	$1,225	$1,681
% of Food at Home	*21.7%*	*21.6%*	*22.4%*	*22.3%*	*21.4%*	*21.5%*
Misc. Foods	$973	$562	$724	$795	$1,149	$1,634
% of Food at Home	*19.7%*	*18.1%*	*18.9%*	*18.8%*	*20.0%*	*20.9%*
Beverages	$455	$300	$366	$403	$536	$670
% of Food at Home	*9.2%*	*9.7%*	*9.6%*	*9.5%*	*9.3%*	*8.6%*
Sugar/ sweets	$166	$114	$130	$149	$184	$253
% of Food at Home	*3.3%*	*3.7%*	*3.4%*	*3.5%*	*3.2%*	*3.2%*
Fats/oils	$133	$89	$113	$116	$142	$202
% of Food at Home	*2.7%*	*2.9%*	*3.0%*	*2.7%*	*2.5%*	*2.6%*

Source: US Bureau of Labor Statistics, Consumer Expenditure Survey, *Table 1101: Quintiles of Income Before Taxes*, https://www.bls.gov/cex/tables/calendar-year/mean-item-share-standard-error/cu-income-quintiles-before-taxes-2020.pdf.

and food purchased away from home (e.g., restaurants, fast food) accounted for 32% ($2,375) of sales. Across all income quintiles, consumer expenditures were spread across the food groups in roughly the same way, though the dollar amounts were different. One notable difference is that people in the lowest quintile spent a much larger percentage of income on food for consumption at home (75.6%) compared to people in the highest income quintile (63.8%). In contrast to dietary guidelines and the cost recommendations for TFP, the CES indicates that **miscellaneous foods (e.g., prepared meals, canned food, chips), bakery products (e.g., bread, crackers, cookies), and nonalcoholic beverages (e.g., soda) were the top single food expenditure categories.**

Comparing CES and TFP expenditures for all foods (Table 7), TFP supports healthier eating by allocating the majority of expenditures to the five major food groups, particularly vegetables, fruits, and dairy; and by dramatically curtailing "Miscellaneous +" spending on fats, sweeteners, beverages, and prepared foods (e.g., compare 35% on Miscellaneous expenditures from the CES to 7% from the TFP). Note that TFP categorizes foods in a slightly different way than the CES, combining fats and oils, sweeteners, snacks, beverages, and prepared foods into a larger "Miscellaneous" category.

If we compare the percentage of CES, TFP, and Resilient Eating expenditures among the five major food groups (i.e., vegetables, fruits, grains, dairy, and proteins), we see that consumers spend more money on proteins and grains than is recommended by TFP, Resilient Eating, and dietary guidelines (Table 8). The TFP recommends spending more money on vegetables and dairy than either CES or Resilient Eating. The Resilient Eating dietary pattern suggests spending more on fruits and less on everything else compared to CES results and TFP recommendations (Resilient Eating and TFP are tied for suggested expenditures for grains).

TABLE 7: Comparison of Consumer Expenditure Survey,* and Thrifty Food Plan

Food Group	2020 Consumer Expenditure Survey %	2021 Thrifty Food Plan %
Vegetables	10.2%	23.9%
Fruits	9.6%	14.0%
Grains	12.9%	15.9%
Dairy	9.6%	14.5%
Proteins	21.7%	24.6%
Miscellaneous+**	34.9%	7.1%
Fats and Oils	*2.7%*	
Sweeteners	*3.3%*	
Beverages	*9.2%*	
Miscellaneous***	*19.7%*	
TOTAL	**100.0%**	**100.0%**

* Consumer Expenditure Survey breakdown is only for "Food at Home." It is the average across all quintiles.
** Miscellaneous + is a Thrifty Food Plan category that includes fats, oils, sweeteners, and beverages.
*** Miscellaneous is a Consumer Expenditure Survey category that includes prepared foods, snacks, etc.

If we compare the profile of Resilient Eating expenditures among the five major food groups to those of the Thrifty Food Plan (Table 9, last three columns), some interesting differences emerge. Both show a similar increase in spending on vegetables, but Resilient Eating has a much larger allocation of expenditures on fruit than TFP (27% compared to 15%). Grain expenditures are similar, but dairy is notably higher in TFP than Resilient Eating, presumably because TFP follows the dietary guidelines to increase dairy intake, whereas Resilient Eating does not. Finally, Resilient Eating encourages a

TABLE 8: Comparison of Expenditures for Five Main Food Groups for Consumer Expenditure Survey, Thrifty Food Plan, and Resilient Eating

AMONG 5 MAIN FOOD GROUPS			
Food Group	2020 Consumer Expenditure Survey %	2021 Thrifty Food Plan %	2030 Resilient Eating %
Vegetables	16%	26%	22%
Fruits	15%	15%	27%
Grains	20%	17%	17%
Dairy	15%	16%	12%
Proteins	34%	27%	22%
	100%	**100%**	**100%**

greater reduction in protein spending than does TFP, which is probably because TFP follows the dietary guidelines to greatly increase seafood (which is relatively expensive), while Resilient Eating does not. Similarly, the proposed changes in servings for the five major food groups in Resilient Eating can be used to calculate resulting changes in at-home food expenditures by the average American consumer (Table 9). Sharp increases in expenditures for vegetables and fruits from 2020 to 2030 can be partially offset by a significant decrease in spending on protein.

However, if a decline in "Other" foods similar to the TFP savings in these foods could be achieved—reducing them from 36% to 7% of expenditures—it might be possible for a *very disciplined* food consumer to partake of Resilient Eating for a cost somewhat lower than what the average American spends on food today.

Those with a lower-than-average household income (i.e., the 40% of Americans who fall into the first and second income quintiles) could not easily afford even the TFP without both dramatically changing eating habits and curtailing other expenditures, or receiving some kind of public support.

Notably, the Thrifty Food plan is calculated based entirely on eating at home—whereas Americans typically spend at least half of their food dollar eating out (this was not true in 2020, due to the COVID-19 pandemic). Vermont, in calculating its "Basic Needs Budget" uses the two-steps more generous USDA "Moderate-cost" food plan, which amounted to $12,624 in 2020 for a family of four. Perhaps the Moderate food plan would make a more reasonable benchmark for what it might cost to procure the Resilient Eating diet.

As to how the cost of Resilient Eating might be affected by the second part of the equation stated above—"eating a more sustainably and justly-produced diet, with a larger proportion coming from local and regional sources"—we have no good way to calculate this "premium." Presumably, providing a decent return to food producers and a fair wage to food system workers, coupled with more sustainable (and hence more costly) production methods, would add something to the cost of food. However, this might be partly offset by a strong focus on whole foods, more direct links between producers and consumers, and eating more seasonably. In addition, the best comparison is not between 2030 Resilient Eating and the cost of food today, but rather to whatever the cost of food delivered by an increasingly brittle global industrial supply chain may rise to by 2030, in a world of pandemics, geo-political struggle, and climate crisis.

A 2021 Rockefeller Foundation report found that while Americans pay about a trillion dollars for food, the "true cost" to society of the way we produce and consume food is at least triple that amount. Another trillion is added by health care costs resulting from how we eat, and almost another trillion by environmental costs.

The implications could not be clearer: by making the relatively small investment to make sure that all New Englanders have access to and can achieve Resilient Eating, which would eliminate these hidden health and environmental costs of our food system, we would realize an immense and, frankly, immeasurable social benefit. This "opportunity benefit" is the true measure of the value of Resilient Eating.

TABLE 9: Comparison of Current Consumption and Resilient Eating

Food Group	2020 Consumer Expenditure Survey $	2019 Servings	% of 5 Main Groups	% of All Food at Home
CURRENT CONSUMPTION (2,900 CALORIES)				
Vegetables	$503	1.8	16%	10%
Fruits	$474	0.9	15%	10%
Grains	$640	7.3	20%	13%
Dairy	$474	1.5	15%	10%
Proteins	$1,075	7.8	34%	22%
Total 5 Groups	$3,166	19.3	100%	64%
Other Food at Home	$1,776			36%
ALL FOOD AT HOME	**$4,942**			**100%**

Food Group	Projected 2030 Consumer Expenditure Survey $	2030 Servings	% of 5 Main Groups	% of All Food at Home
RESILIENT EATING (2,300 CALORIES)				
Vegetables	$838	3.0	22%	20%
Fruits	$1,053	2.0	27%	25%
Grains	$658	7.5	17%	16%
Dairy	$474	1.5	12%	11%
Proteins	$861	6.25	22%	21%
Total 5 Groups	$3,885	20.25	100%	93%
Other Food at Home	$292			7%
ALL FOOD AT HOME	**$4,177**			**100%**

5 Next Steps

Can the six New England states provide 30% of their food from regional farms and fisheries by 2030? The New England State Food System Planners Partnership, through its *New England Feeding New England* project, set out to explore this question. Inspired by Food Solution New England's *New England Food Vision* of achieving 50% regional consumption by 2060, our objective was to better understand our current food system environment, and exactly what it will take to grow, raise, produce, harvest, catch and move more food through a complex regional supply chain to our homes and other places we eat.

The 16 NEFNE researchers developed this foundational research so that we can begin to mobilize around a regional food goal, develop strategies, and take action to build a more just, equitable, resilient, and reliable regional food system. A central concept of this approach is the idea of **regional food self-reliance**, **which is an estimate of how much food we produce compared to how much food we consume.** No single county or state can provide a full menu of food products to meet the needs of its population. For example, within New England, the northern states have *most of the farmland*, while the southern states have *most of the consumers*. Moving toward 30x30 will require, for example, enormous investment in retaining and expanding land in agriculture in the northern states, with most of the people, political power, and potential sources of funding based in southern New England.

A resilient regional food system is both an *investment* in our shared future and an *insurance policy* against future risks.

This dynamic—big population centers in the southern states, and major agricultural production in the northern states—sets the stage for exploring regional food self-reliance.

Volume 1 has highlighted that transitioning to a more "resilient eating" pattern that was aligned with USDA dietary guidelines undoubtedly presents a daunting challenge for New Englanders. To begin with, reducing the average caloric intake by over 600 calories per day by 2030 would be no easy feat. Under this scenario, the average New Englander would need to reduce meat consumption by over a third, while increasing levels of both seafood and plant protein. We would need to cut our consumption of added fats and sugars in half, while increasing vegetables by 60%, and doubling fruit intake. These changes may not happen in seven years, but they point the way toward a future where the region eats more healthfully and resiliently.

The Questions We Started With

- If we ate in a healthier, more resilient way, could more of our food be supplied by regional production?
- Could the six New England states meet a goal of supplying 30% of the region's food by 2030?
- Do we have the right mix of industries to ramp up food production? What sectors are growing? What sectors are contracting?
- What market channels offer the best opportunities for sourcing regional and local products?
- What might change if we intentionally and regionally plan for our future, making significant investments in strengthening our regional food system and communities?

After a year of intensive exploration by four research teams, we can begin to answer these questions. We have identified key stakeholder groups that we want to engage with over the coming years, because we believe that they have a big role to play in producing and sourcing more regional food and getting into the market channels where most New Englanders access it. We have identified a number of areas where additional investments are most needed to have the greatest impact in order to achieve the 30% regional goal.

The Questions We Now Have

What do we need to do by 2030 to make tangible progress towards this bold vision? What can we do as a region to make our regional food system more equitable and fair, resilient and reliable?

Food Consumption Questions

- What strategies and policies can discourage consumption of ultra-processed food and beverage products?
- How can the number of low income/low access census tracts be reduced in urban and rural areas?
- What additional public support is necessary to enable lower income New Englanders to purchase/access regional food and beverage products?
- What public awareness and messaging campaigns are needed to inspire and enable New Englanders to eat more regionally produced foods?
- How can we increase the amount of regional and local food and beverage products in our stores?
- How can we institutionalize food is medicine strategies throughout the region?
- How can we create a more integrated food and nutrition security system throughout the region?
- What would need to change for people to change their dietary patterns?

What Comes Next for the Region?

A regional approach to food system resilience means that we work collectively to adapt, expand, and fortify New England's food production and distribution systems to ensure the availability of adequate, affordable, and culturally appropriate food for all who call New England home. As a collaboration between state-level food system organizations and the region-wide Food Solutions New England network, the New England Feeding New England project provides additional focus for communication, collaboration, and coordination in the region.

It is clear that sustained and collaborative action along with a significant and coordinated investment of resources will be required to meet the 30% by 2030 goal. But we know that the work we intend to do together is by no means the totality of what will be needed. We invite you to consider—and then act upon—how your business, your organization, your community and your choice around the food you consume can contribute towards the regional goal we are inspired to work towards. All of us will need to work together, in alignment, to make progress toward this goal. Each of us—whether we are a farmer, fisher, food entrepreneur, retailer, nonprofit organization, researcher, educator, capital provider, government official, community organizer, or an "eater"—has an important role to play. Each of us has something to contribute, to advance, to accomplish.

System-level change is by its very nature complex, and no one organization, entity or state can change it alone. System-level change requires collaboration, highly networked multi-stakeholder alignment, transparency, continuous communication and strategic action that is properly resourced and built upon trusted relationships.

So let's come together around this goal of 30% by 2030 so that we can build the kind of equitable, resilient, and reliable regional food system that we need to adapt to climate change and ensure that everyone who lives in New England has access to healthy, regionally sourced food from successful food producers and retailers.

We need to do this. We can do this. We invite you to be part of what comes next.

6 Endnotes

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NEW ENGLAND FEEDING NEW ENGLAND

Working together, New Englanders can transform our food system to meet the challenges we face today, while ensuring a stable, equitable, and sustainable supply of healthy food for future generations.

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FIGURE 8: Connecticut Demographics by Percent Living in Low Income/Low Access Census Tracts

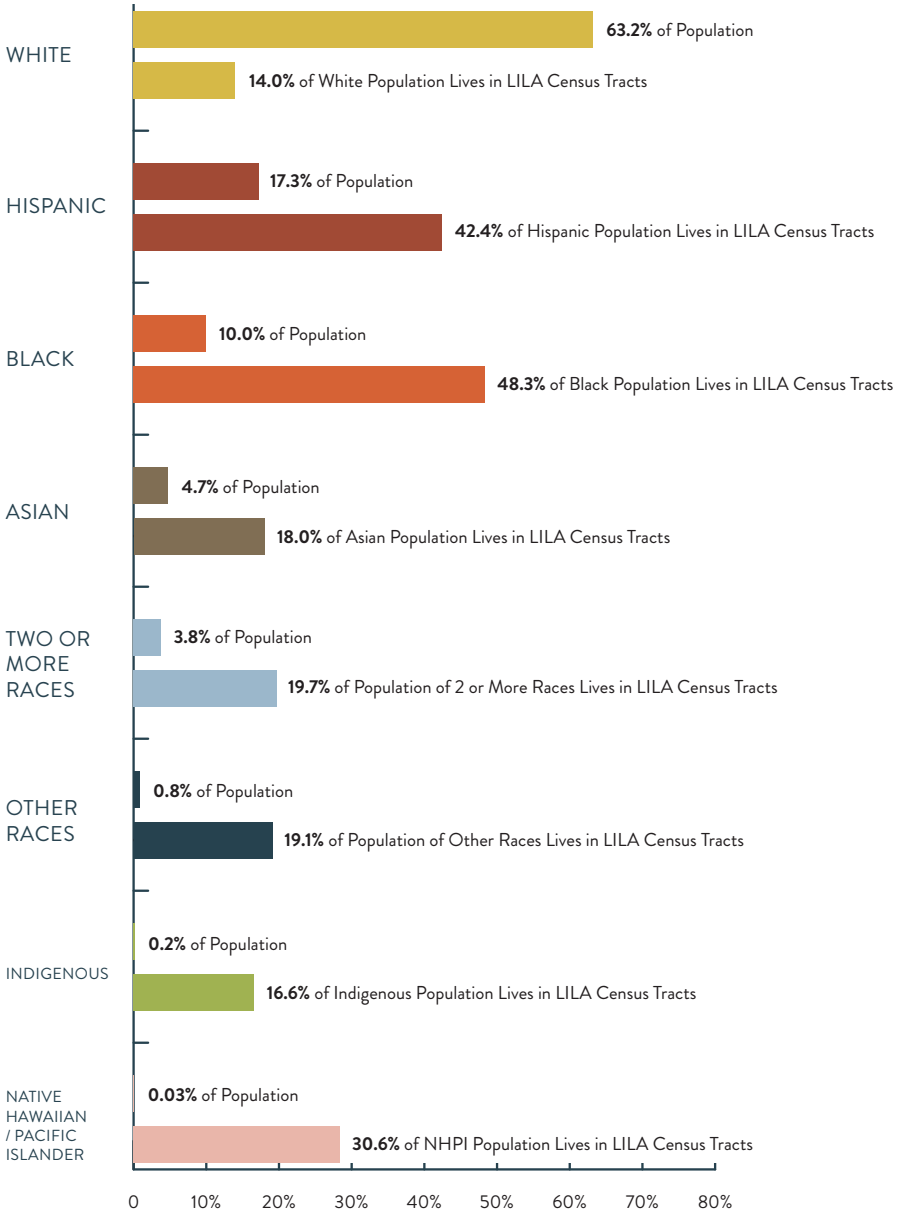

FIGURE 9: Maine Demographics by Percent Living in Low Income/Low Access Census Tracts

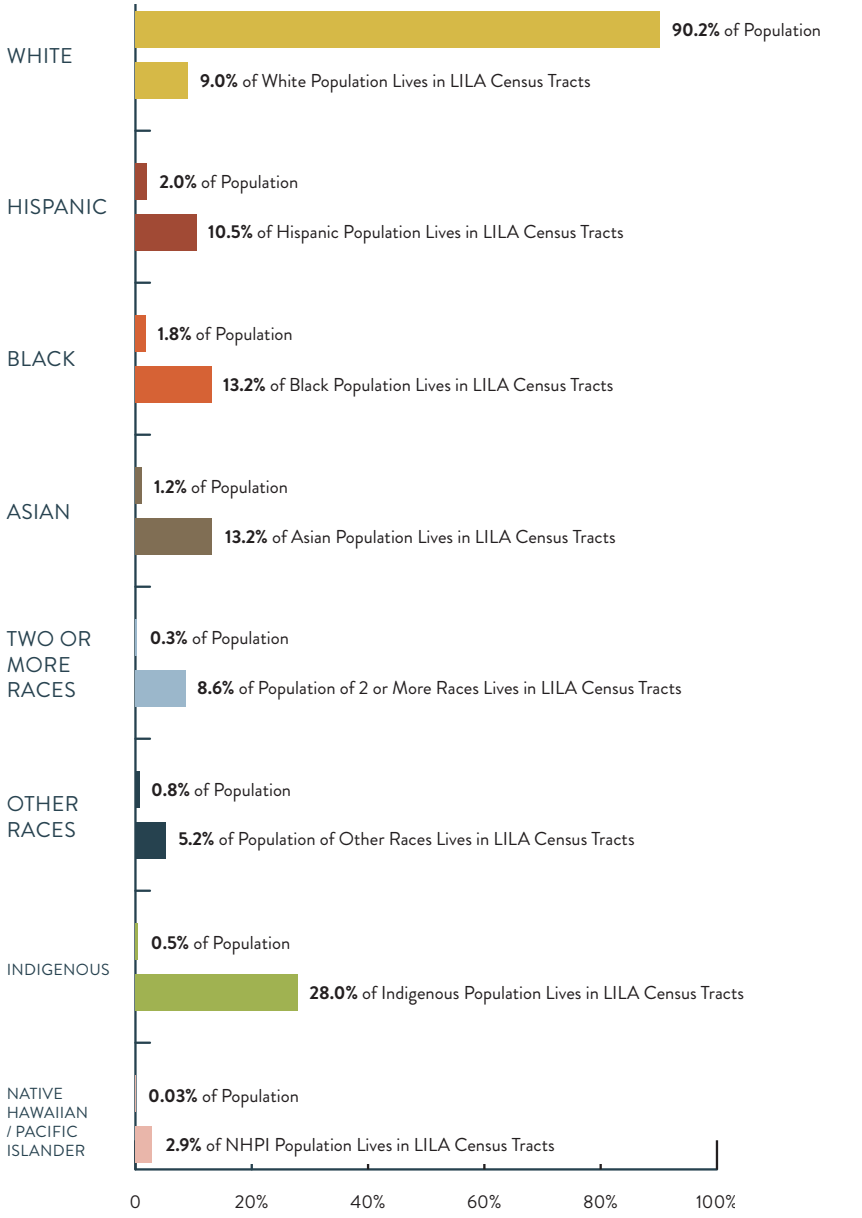

FIGURE 10: Massachusetts Demographics by Percent Living in Low Income/ Low Access Census Tracts

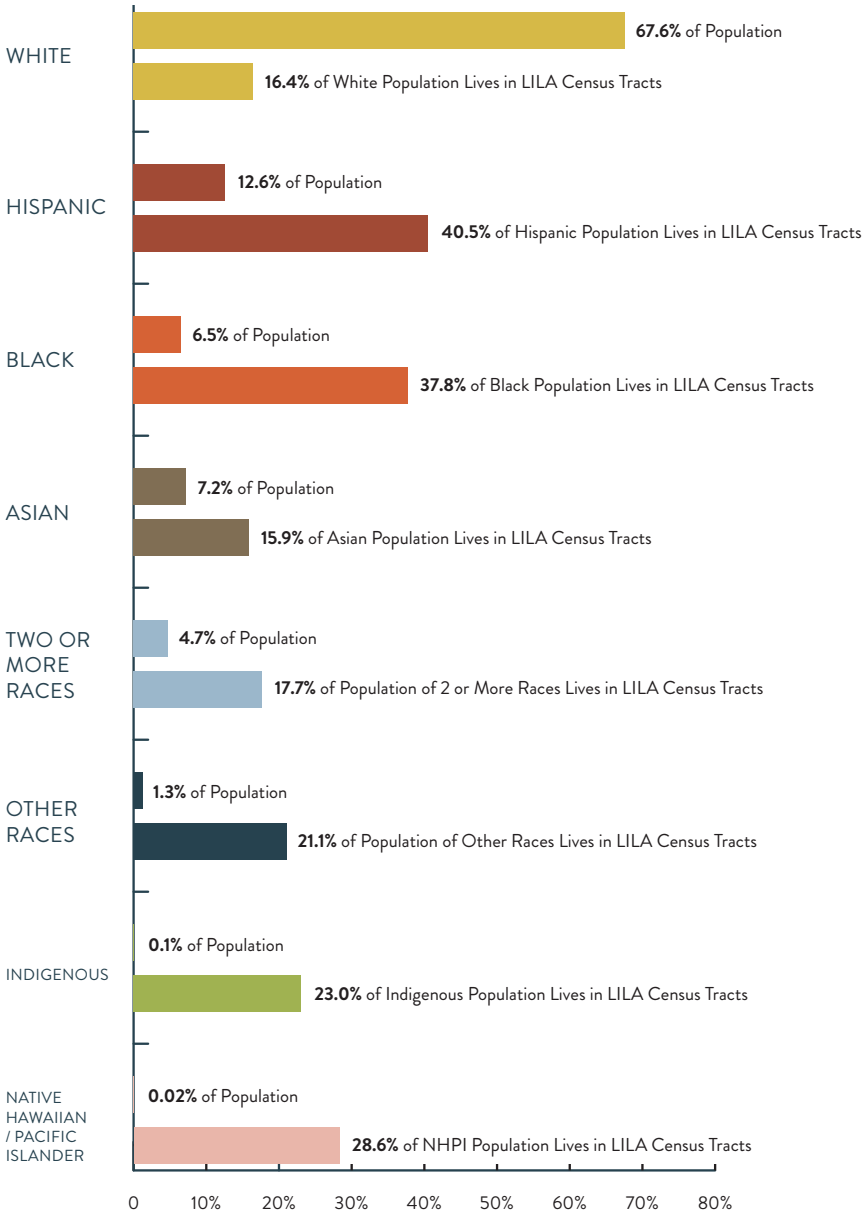

FIGURE 11: New Hampshire Demographics by Percent Living in Low Income/ Low Access Census Tracts

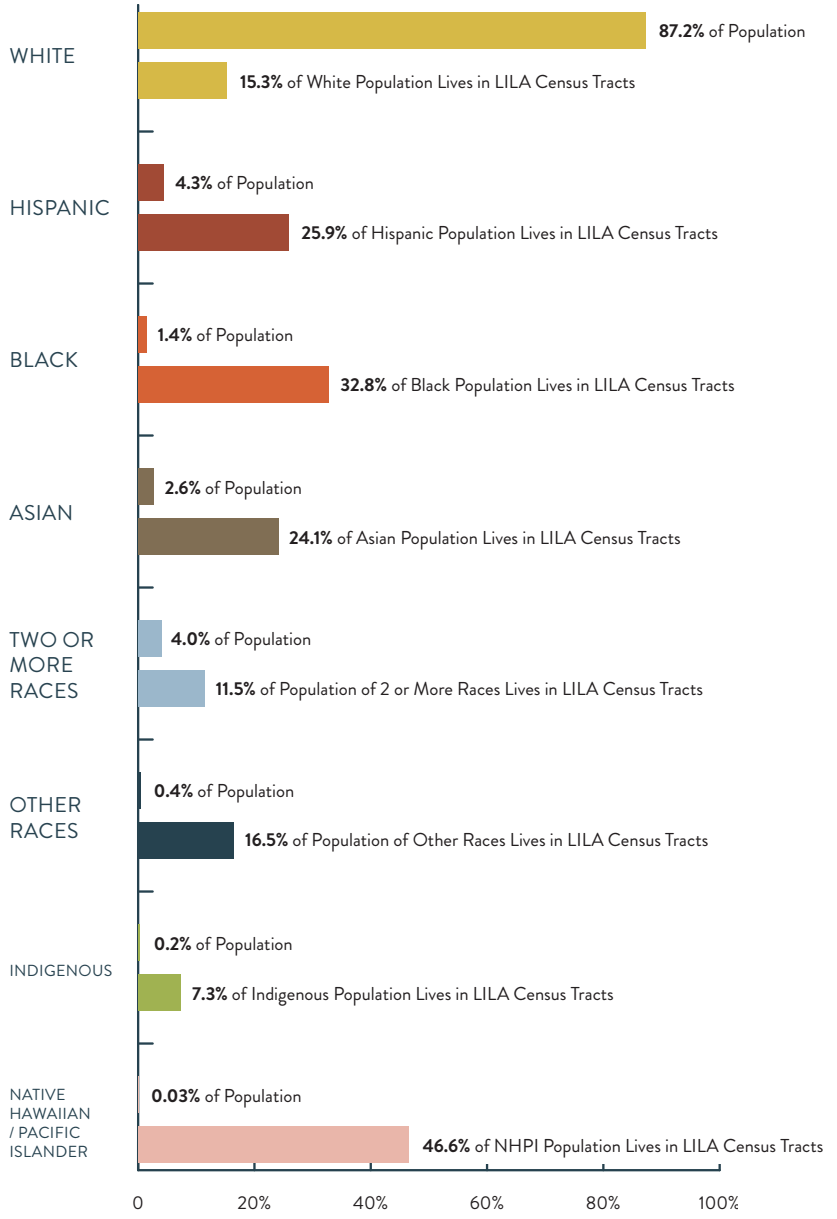

FIGURE 12: Rhode Island Demographics by Percent Living in Low Income/Low Access Census Tracts

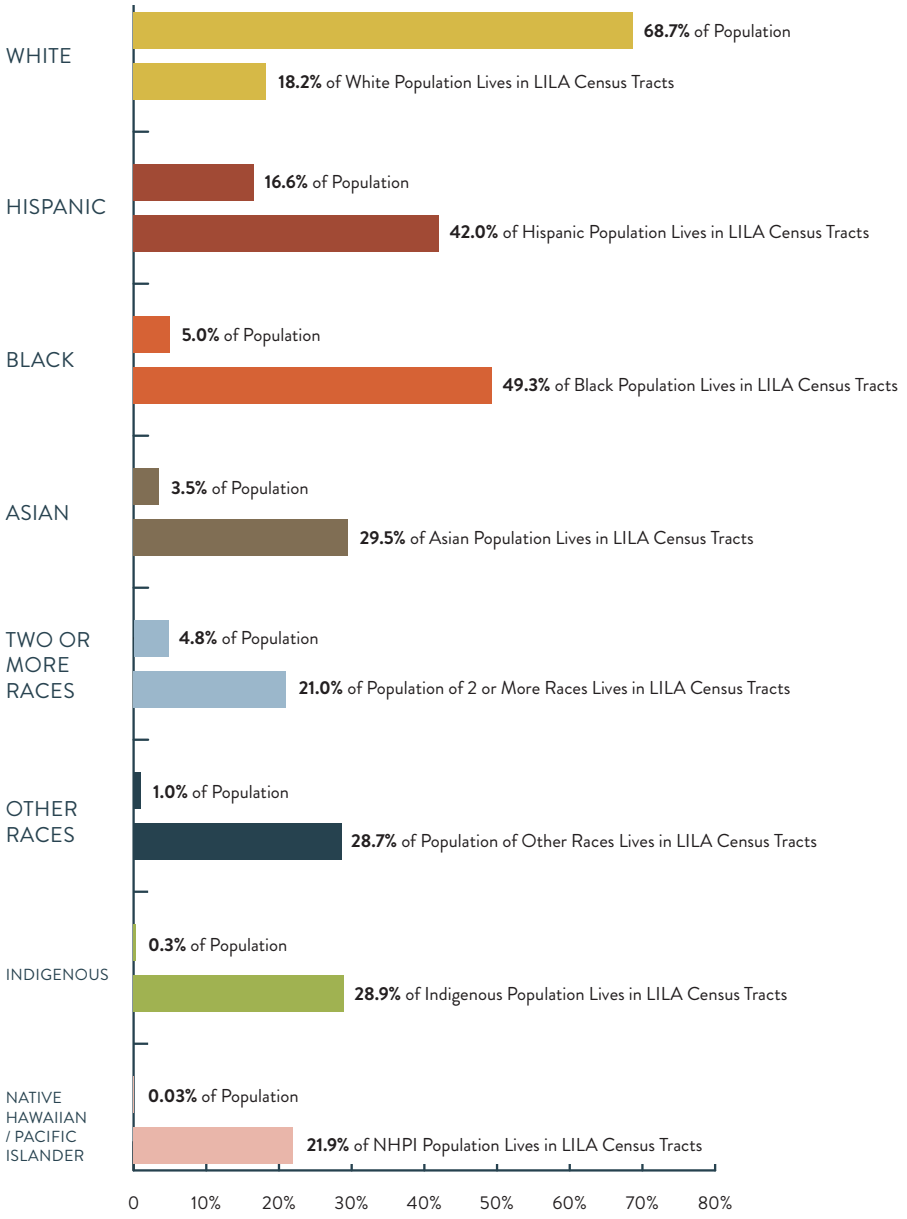

FIGURE 13: Vermont Demographics by Percent Living in Low Income/Low Access Census Tracts