

INPUT: DIETARY GUIDELINES AND INTAKE RECOMMENDATIONS; NUTRITIONAL VALUE OF FOODS

Food Group Amounts for 2,000 Calories a Day

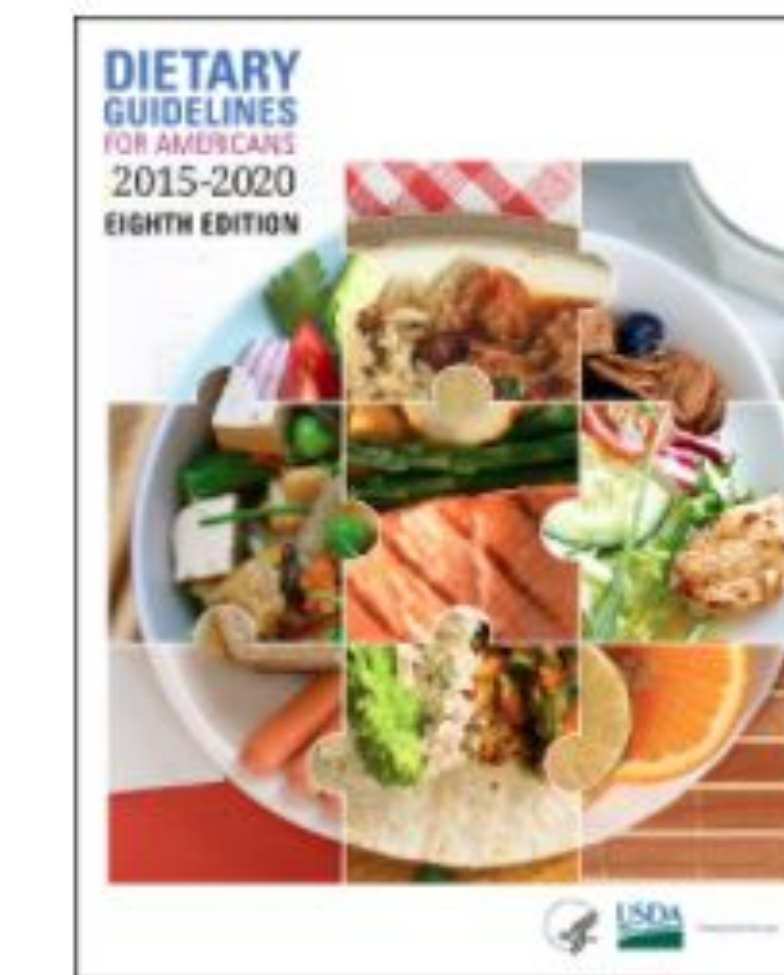
Fruits	Vegetables	Grains	Protein	Dairy
2 cups	2 1/2 cups	6 ounces	5 1/2 ounces	3 cups
Focus on whole fruits	Vary your veggies	Make half your grains whole grains	Vary your protein routine	Move to low-fat or fat-free milk or yogurt
Focus on whole fruits that are fresh, frozen, canned, or dried.	Choose a variety of colorful fresh, frozen, and canned vegetables—make sure to include dark green, red, and orange choices.	Find whole-grain foods by reading the Nutrition Facts label and ingredients list.	Mix up your protein foods to include seafood, beans and peas, unsalted nuts and seeds, soy products, eggs, and lean meats and poultry.	Choose fat-free milk, yogurt, and soy beverages (soy milk) to cut back on your saturated fat.



Drink and eat less sodium, saturated fat, and added sugars. Limit:

- Sodium to **2,300 milligrams** a day.
- Saturated fat to **22 grams** a day.
- Added sugars to **50 grams** a day.

Be active your way: Children 6 to 17 years old should move **60 minutes** every day. Adults should be physically active at least **2 1/2 hours** per week.



2015–2020 Dietary Guidelines for Americans

The 2015–2020 *Dietary Guidelines* is designed to help Americans eat a healthier diet. Intended for policymakers and health professionals, this edition of the *Dietary Guidelines* outlines how people can improve their overall eating patterns — the combination of foods and drinks in their diet. This edition offers five overarching Guidelines and several Key Recommendations with specific nutritional goals and dietary limits.

USDA U.S. DEPARTMENT OF AGRICULTURE
Agricultural Research Service

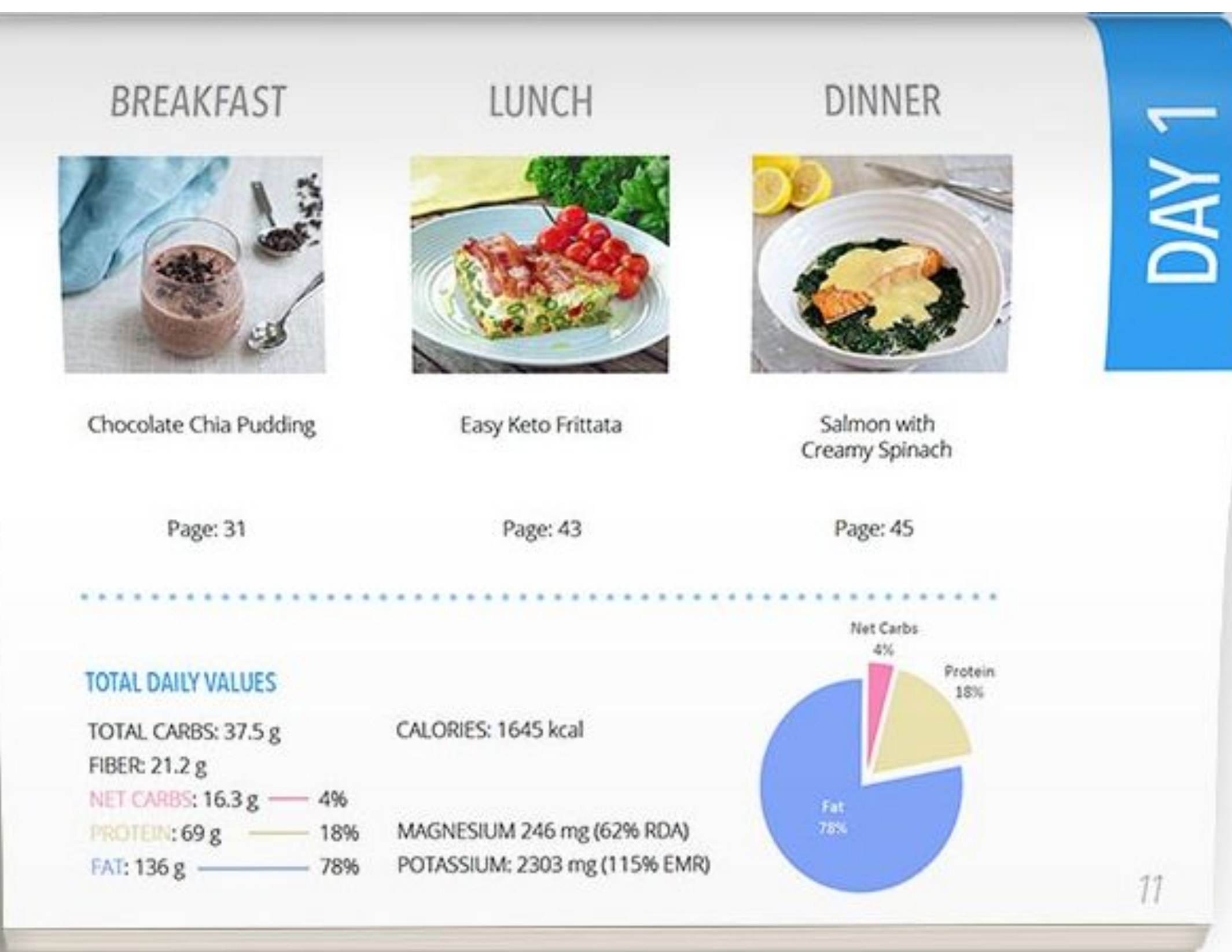


METHOD OF APPROACH: MATHEMATICAL OPTIMIZATION MODELS (MIXED INTEGER LINEAR PROGRAMS)

$$\begin{aligned} &\text{minimize } c^T x \\ &\text{subject to } Ax \leq b \\ &\quad x \geq 0 \\ &\quad x \in X \subseteq \mathbb{R}^n \end{aligned}$$

objective function: expresses personalized dietary goals (individual objectives and expert recommendations)
constraints: based on dietary guidelines provided by US Department of Agriculture, tailored to individual
variables: quantities of specific meals to be included in the optimal diet that satisfies the constraints addressing the dietary guidelines (some of the variables are required to be integer)

OUTPUT: OPTIMAL DIET PLANS



- The output of the optimization model provides a personalized nutrition recommendation system that
- makes an optimal selection from the available set of foods
 - suggests new dishes/supplements based on the user's conditions and preferences
 - provides insights into how changes in intake recommendations effect the optimal diet plans

FUTURE WORK

- Evaluation of popular diets with respect to dietary guidelines of the US Department of Agriculture
- Network-based models of food systems: Building and analyzing networks of foods and diets