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## **Do Americans Change Toward Healthy Diets?**

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## Introduction

### The American Diet

- As obesity and overweight in the United States impose a greater physical and economic toll on the Nation, the public has become more aware of the relationship between diet and weight.
- For several decades, Federal nutrition education efforts have focused on providing consumers with information to help them make healthy food choices. The Government has taken steps through various food programs to reduce obesity among Americans.
- As the Government's efforts intensify, whether there has been a change toward a healthy diet is a timely research issue of interest to researchers and food policy decisionmakers.
- To understand the American diet, we compared the changes in nutrients contributed by major food groups over years with the economic factors that affect changes in nutrient availability.

### Data for This Study

- Per capita food consumption data for 131 food items during 1953-2006 came from the USDA/Economic Research Service's *Food Availability Data*. These individual foods were then aggregated into 14 food groups: beef, pork, poultry, fish, eggs, dairy, fats, fruits, vegetables, processed fruits/vegetables, flour, starch, sugar, and beverages.
- The values of 28 nutrients for each food item were compiled from the USDA/Agricultural Research Service's *The Online Version of Agriculture Handbook No. 8*.
- All food group price indexes were obtained from the U.S. Department of Labor's *Consumer Price Index*, and per capita total expenditure was obtained from the U.S. Department of Commerce's *Personal Consumption Expenditures*.

## Methodology

### Step 1: Measure food demand elasticities

An aggregate differential-form food demand system consisting of 14 food groups for 1953-2006 was estimated by incorporating the parametric constraints of homogeneity, symmetry, and Engel aggregation:

$$dq_i / q_i = \sum_j e_{ij} (dp_j / p_j) + \eta_i (dm / m) ,$$

where  $p_i$  is price,  $q_i$  is quantity,  $e_{ij} = (\partial q_i / \partial p_j)(p_j / q_i)$  is price elasticity, and  $\eta_i = (\partial q_i / \partial m)(m / q_i)$  is income elasticity.

### Step 2: Measure food nutrient values

The availability of a nutrient,  $\varphi_k$ , was measured using per capita food consumption data and associated unit nutrient values:

$$\varphi_k = \sum_i a_{ki} q_i ,$$

where  $a_{ki}$  is  $k$ th nutrient from a unit of the  $i$ th food.

### Step 3: Measure food nutrient demand elasticities

By incorporating the demand system into a nutrient availability equation, we obtained a nutrient demand system:

$$d\varphi_k / \varphi_k = \sum_j \pi_{kj} (dp_j / p_j) + \rho_k (dm / m) ,$$

where  $\pi_{kj} = \sum_i e_{ij} a_{ki} q_i / \varphi_k$  is nutrient price elasticity, and  $\rho_k = \sum_i \eta_i a_{ki} q_i / \varphi_k$  is nutrient income elasticity.

## Results

- Among 28 nutrients in this study, results show that 4 nutrients are currently public health concerns—excessive intake levels for food energy, total fat, cholesterol, and intake level shortfalls for calcium. The results provide a comparison of U.S. average nutrient values per capita per day for these four nutrients between 1953-79 and 1980-2006. The responses of these four nutrients to changes in income and the price of 14 food groups are also included.
- **Food energy:** Between the two periods, food energy intake increased substantially, from 2,999 to 3,468 kilocalories (kcal) per day. This 16-percent increase reflects higher intake levels of some energy-yielding food groups—fats, poultry, flour, and sugar. Fats contributed the most to this increase, increasing from 546 to 736 kcal per day. The estimated nutrient responses indicate that a price increase of 10 percent for pork, poultry, dairy, and flour would reduce energy intake within a range of 15 and 21 kcal per day.
- **Total fats:** The consumption of total fat increased from 137 to 162 grams per day between the two periods. The increase came mostly from fats, increasing from 61 to 83 grams per day. Other major sources of total fats, such as red meats and dairy products, showed a slight decrease. The effect of a 10-percent price increase for fats would reduce total fats intake by only 0.3 gram per day, while the same price increases for dairy and flour would reduce total fats intake for each group by about 3 grams.
- **Cholesterol:** The level of cholesterol in the American diet declined from 430 to 402 milligrams per day between the two periods. The decrease reflects reduced consumption from egg, where nutrient values decreased from 182 to 143 milligrams. The effects of a 10-percent increase in the price of eggs would reduce cholesterol consumption by only

1.54 milligrams per day. The same price increase in beef, pork, poultry, and fish would reduce cholesterol intake to within a range of 1.6 and 3.8 milligrams.

- **Calcium:** Calcium levels in the U.S. food supply is quite stable, with a slight increase from 865 to 890 milligrams per day between the two periods. Dairy consumption, as a major source (about 77 percent) of calcium, decreased slightly from 676 to 671 milligrams per day. A 10-percent increase in dairy price would reduce calcium intake by 3.66 milligrams per day, while the same price increase for fish and fats would reduce calcium intake for each group by about 9 milligrams.

- The nutritional effects from higher consumer income are mixed. A 1-percent income increase would improve calcium intake (currently insufficient) by 2.49 milligrams per day, but it would also increase intake of nutrients that are already excessive, such as energy by 7.31 kcal, total fats by 0.59 grams, and cholesterol by 1.13 milligrams.

## **Conclusion**

- American's nutritional and health status appear to be trending toward healthier diets, as measured by a reduction in cholesterol intake and an increase in calcium intake. The levels of food energy and total fats, however, increased substantially.

- The estimated nutrient responses show that changes in the availability of all nutrients vary depending on how food prices and income changes manifest themselves through the food demand relationships. Nutrient response estimates can be used to study food program effects on the overall availability of nutrients.

**Draft**

### Nutrient values and their economic responses by food groups

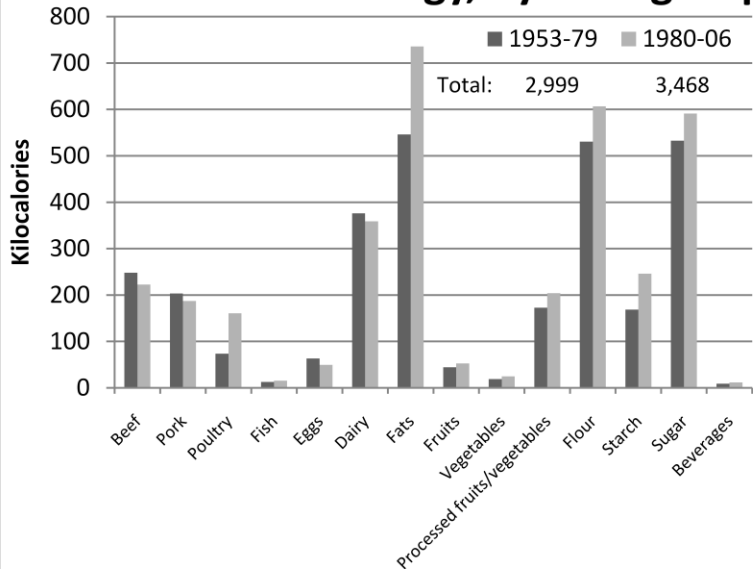
Nutrient changes	Period	Beef	Pork	Poultry	Fish	Eggs	Dairy	Fats	Fruits	Vegetables	Processed Fruits/vegetables	Flour	Starch	Sugar	Beverages	Total
		<i>Changes in nutrient values between 1953-1979 and 1980-2006</i>														
Energy (Kcal)	1953-79	248	203	74	13	63	376	546	44	19	173	531	168	533	9	2999
	1980-06	223	187	161	16	50	359	736	53	25	204	607	246	591	12	3468
Total fat (gram)	1953-79	20.3	18.9	4.9	0.4	4.3	19.9	61.2	0.3	0.1	4.1	1.4	0.7	0.0	0.6	137.1
	1980-06	18.4	17.4	10.8	0.5	3.4	19.6	82.6	0.5	0.2	4.9	1.6	1.0	0.0	0.7	161.5
Cholesterol (milligram)	1953-79	64.8	40.3	27.3	4.5	181.7	76.4	34.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	429.7
	1980-06	57.1	36.9	59.6	5.5	142.7	69.5	30.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	401.5
Calcium (milligram)	1953-79	7.3	10.2	4.3	4.9	22.8	676.4	4.1	11.1	19.4	56.0	22.0	15.8	5.8	4.9	864.8
	1980-06	6.3	9.4	9.3	4.0	17.9	671.3	3.3	10.7	24.6	64.7	25.1	16.1	20.5	6.5	889.6

Nutrient responses	Beef	Pork	Poultry	Fish	Eggs	Dairy	Fats	Fruits	Vegetables	Processed Fruits/vegetables	Flour	Starch	Sugar	Beverages	Income
	<i>Nutrient responses of a 10-percent price increase or a 1-percent income increase</i>														
Energy (Kcal)	1.04	-15.22	-15.22	-5.35	-1.31	-17.15	-8.03	-4.75	3.39	13.04	-20.45	-4.07	-0.98	1.09	7.26
Total fat (gram)	-0.53	-1.06	-0.23	-0.21	-0.08	-3.16	-0.27	-1.74	-0.10	4.29	-2.71	-0.23	0.13	0.05	0.58
Cholesterol (milligram)	-2.06	-1.60	-1.70	-3.80	-1.54	-1.94	-0.96	-1.29	-0.37	3.78	-1.21	-0.40	0.16	0.31	1.13
Calcium (milligram)	0.44	-0.89	-0.51	-9.39	-0.29	-3.66	-8.55	-0.21	-0.12	2.63	-0.63	-0.19	4.58	2.61	2.48

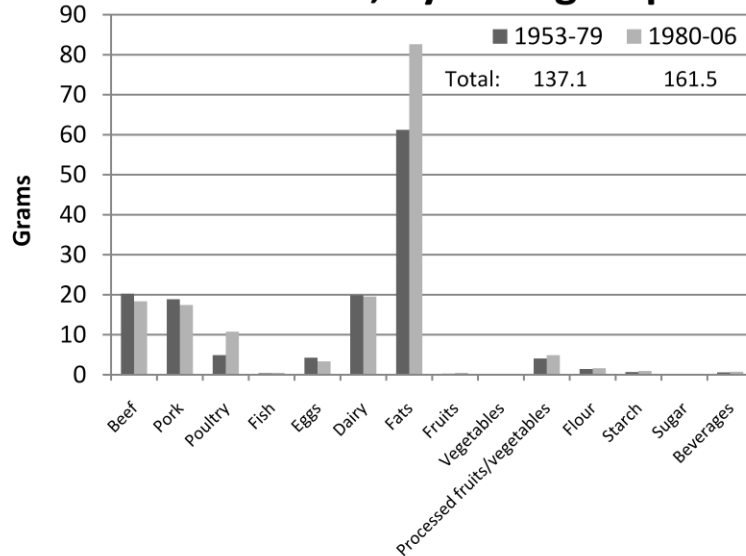
Kcal=kilocalories; and Beverages=Nonalcoholic beverages.

Notes: Nutrient values are based on 131 selected food items. Total fat refers to saturated and unsaturated fatty acids. Fats refers to butter, margarine, and cooking oils.

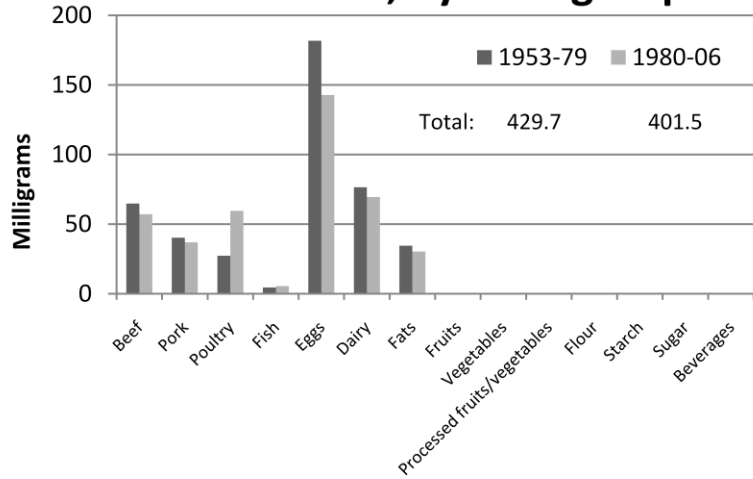
### Food energy, by food group



### Total fats, by food group



### Cholesterol, by food group



### Calcium, by food group

