

Diet quality and socio-demographic characteristics of self-perceived vegetarians in the United States, 1977—2010

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Honors Thesis

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University of North Carolina, 2016

Introduction

Health Reasons for a Vegetarian Diet

- The ***Academy of Nutrition and Dietetics*** (AND): “appropriately planned vegetarian diets...are healthful, nutritionally adequate, and may provide health benefits¹.”
- The ***recent US dietary guidelines***: push against animal source foods and promote greater plant food consumption²

Sustainability of the Vegetarian diet

- The meat-based diet requires more energy from fossil fuels, land resources, and water consumption than a plant-based diet³

1. Messina, V.K. and K.I. Burke, *Position of the American dietetic association: Vegetarian diets*. Journal of the American Dietetic Association, 1997. **97**(11): p. 1317-1321.
2. Scientific Report of the 2015 Dietary Guidelines Advisory Committee. 2015; Available from: <http://health.gov/dietaryguidelines/2015-scientific-report/>.
3. Pimentel D, Pimentel M. Sustainability of meat-based and plant-based diets and the environment. The American Journal of Clinical Nutrition. 2003;**78**(3):660S-3S.

Introduction, cont.

No studies in the US have estimated the **diet composition and socio-demographics of vegetarians** in large, nationally representative sample, or estimated how this has **changed over time**

- It is unclear who now perceives themselves as vegetarian
- It is unclear whether self-perceived vegetarians have increased their meat intake

Introduction, cont.

Research in this area may explain the health benefits of being vegetarian, and disparities in these health benefits among different populations of vegetarians

This study examines the shift in diet composition and socio-demographics of U.S. self-perceived vegetarians, 1977—2010

Methods: Dietary Data

1,230 vegetarians and 69,617 non-vegetarians 19 years and older from three cross-sectional, **nationally representative surveys of dietary intake.**

- **1977-1978** Nationwide Food Consumption Survey (**NFCS**, N = 48,418): “Are you vegetarian?”
- **2007-2008** National Health and Nutrition Examination Survey (**NHANES**), combined with **2009-2010 NHANES** (N = 2249): “{Do you/Does SP} consider {yourself/himself/herself} to be a vegetarian?”

All three surveys utilize a complex sampling design in order to provide nationally representative estimates for dietary intake^{4,5}

4. National Survey Data on Food Consumption: Uses and Recommendations. THE NATIONWIDE FOOD CONSUMPTION SURVEYS. Vol. 2. Washington (DC): National Academies Press (US).

5. Curtin, L.R.M., L.K.; Dohrmann, S. M., *National Health and Nutrition Examination Survey: Sample Design, 2007–2010*. National Center for Health Statistics. Vital Health Stat, 2013. **2**(160).

Methods: Dietary Data

The first day of both the NFCS (1977-1978) and NHANES (2007-2010) dietary data collection administered an **in-home, 24-hour dietary recall**

NFCS and NHANES are the only two surveys in their respective time periods that use the **same food composition table** (older NHANES surveys use a different table)

U.S. Department of Agriculture (USDA) **National Nutrient Database** for Standard Reference

- Matches food code (i.e. Butter, salted) with food group (i.e. Dairy & Egg Products), and provides nutrient composition (macro and micronutrients, water, energy, fiber, sugar, etc.)

Methods: Dietary Data

USDA's **Food Pyramid Equivalents Database** (FPED) for NHANES 2007-2008, and FPED 2.0 for NHANES 2009-2010

- Ex. 1 Cup cooked rice = 2 oz equivalents grains
- Ex. 1 Large tortilla = 4 oz equivalents grains
- Ex. 16 seedless grapes = ½ cup equivalent fruit

NFCS survey food codes were matched to food codes in NHANES 1999-2004, and MPED values from the oldest available year were used

Data Analysis

- Survey commands in **STATA version 14** used to account for complex survey design and to incorporate sampling weights
- **Logistic regression:** used to calculate **odds of being vegetarian** within socio-demographic groups in each survey year
- **Linear regression:** used to estimate **mean daily consumption** of animal and non-animal source foods in each survey year
- Estimates were **adjusted** for gender, race/ethnicity, household income, and household education
- Linear trends were tested by examining confidence intervals

Results: Socio-demographics

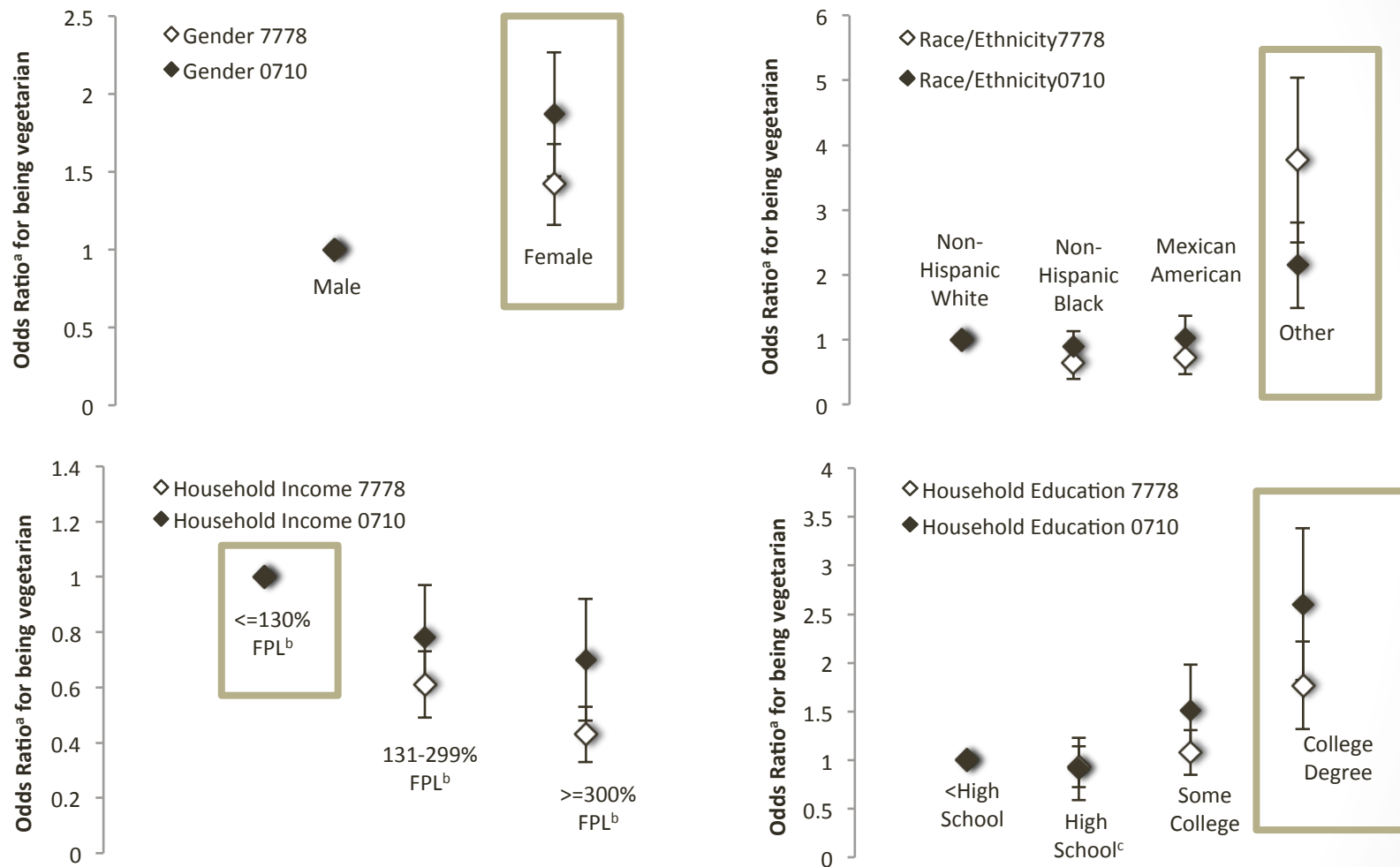


Figure 1. Probability of being vegetarian among socioeconomic groups for people in the United States aged 19 to 100 years, 1977—2010

^aOdds ratios take into account survey design and sample weights.

^bHousehold income expressed as percentage of the Federal Poverty Level (FPL)

^cGraduated from high school or obtained GED

Results: Sociodemographics

Participants younger than 19 years of age were excluded from this analysis.

In both 1977-1978 and 2007-2010, self-perceived vegetarians in the U.S. were more likely

- **Female** (OR, 7778 = 1.42) and (OR, 0710 = 1.87)
- Identify with an ethnicity **other** than Non-Hispanic White (NHW), Non-Hispanic Black (NHB), or Mexican-American (MA)(OR, 7778 = 3.77) and (OR, 0710 = 2.15)
- To **hold a college degree** (OR, 7778 = 1.77) and (OR 0710 = 2.60).
- **≤ 130 % federal poverty level** (FPL) (ref)

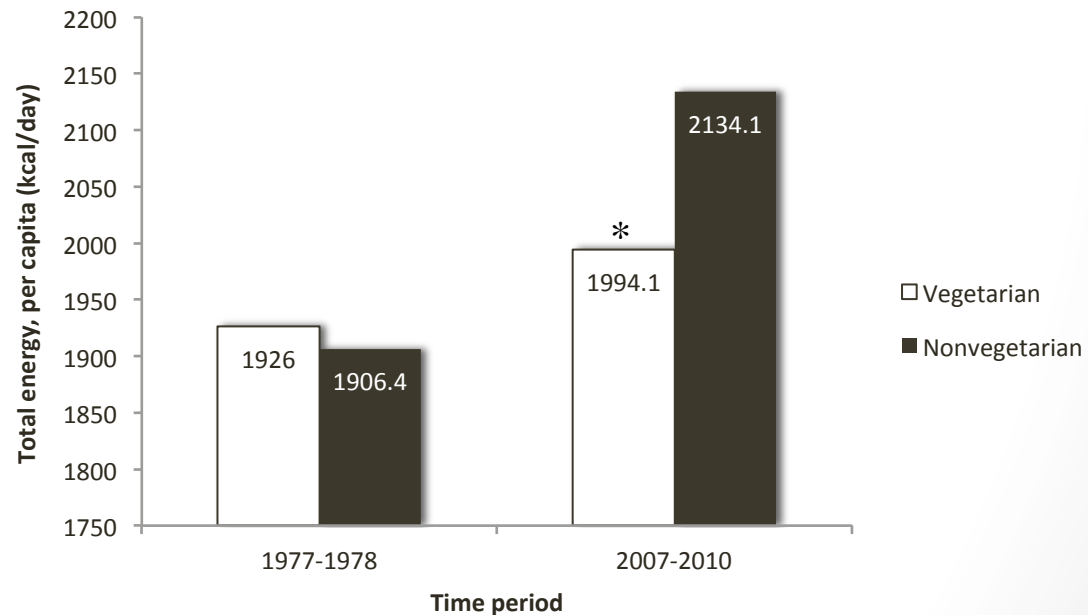
Results: Total Energy Consumed

In 1977-1978, vegetarians and non-vegetarians consumed similar amount of total energy (kcal) per day

In 2007-2010, non-vegetarians consumed more total energy (kcal) per day than vegetarians

Figure 2. Mean total energy intake per capita consumed by vegetarians and nonvegetarians, 1977-2010

*Asterisk indicates significant difference in vegetarian compared to nonvegetarian confidence interval in the given year



Results: Fruits, Whole Grains, SoFAS

In both 1977-1978 and 2007-2010, vegetarians consumed more fruits, more whole grains, and less solid fats than nonvegetarians

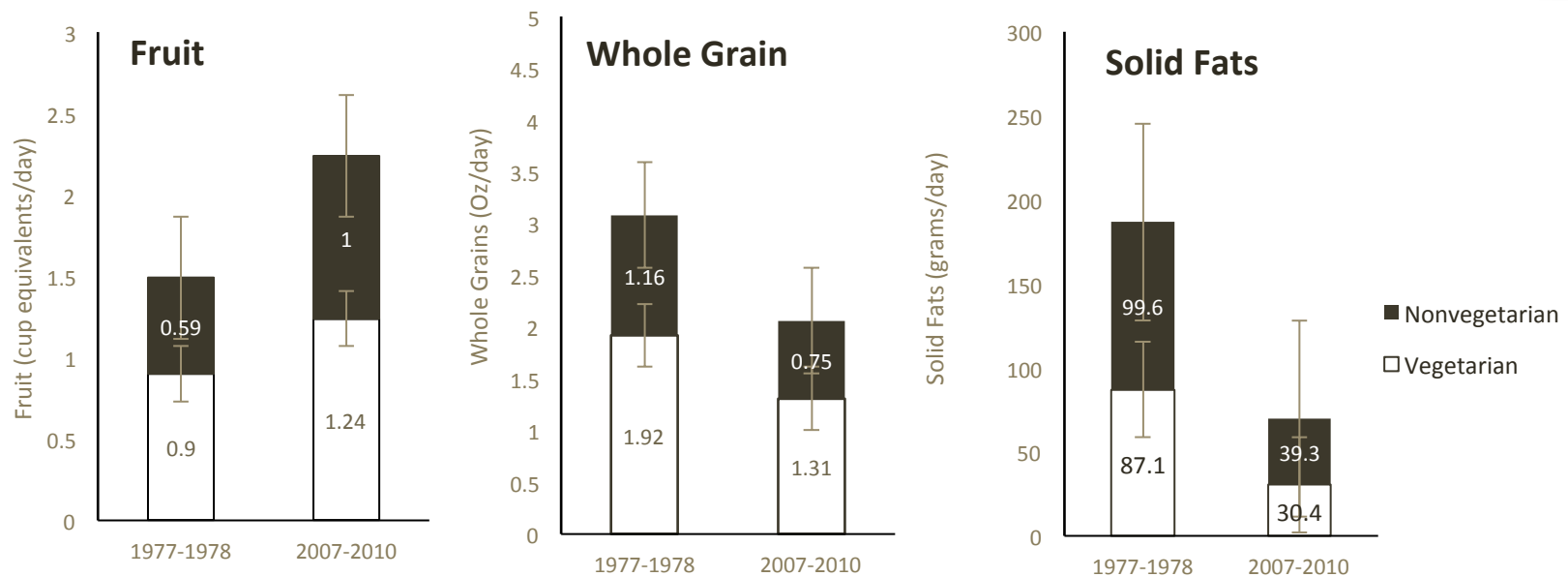


Figure 3. Fruit, whole grain, and solid fat consumption by vegetarians and non-vegetarians in the United States, 1977—2010 (M +/- SE)

Results: Animal-Source Protein

In both 1977-1978 and 2007-2010, vegetarians consumed less poultry and red meat than non-vegetarians, however the amount of poultry and red meat consumed has increased for both groups over time

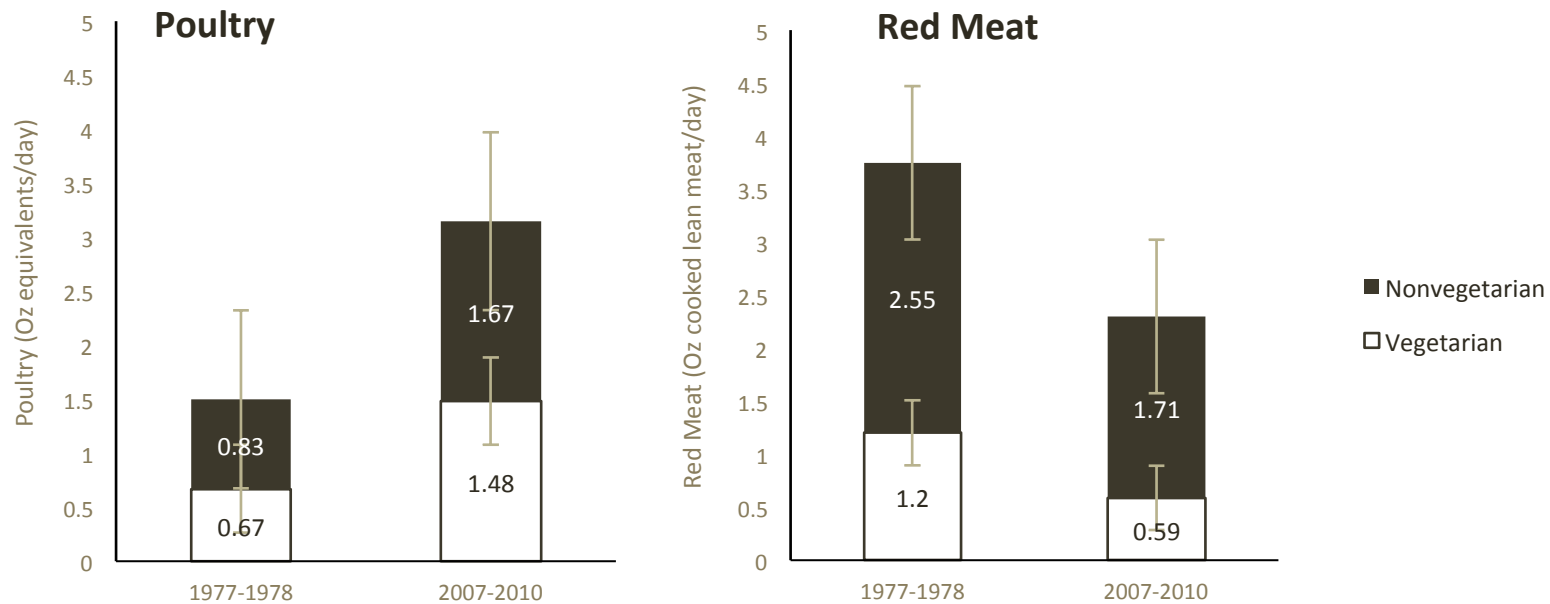


Figure 4. Poultry and Red Meat consumption by vegetarians and non-vegetarians in the United States, 1977—2010 (M +/- SE)

Results: Non-animal-source protein

Between 1977-1978 and 2007-2010...

- Vegetarians increased their mean consumption of legumes by 15 times
- Vegetarians increased their mean consumption of soy products by 3 times
- Vegetarians halved their mean consumption of nuts and seeds

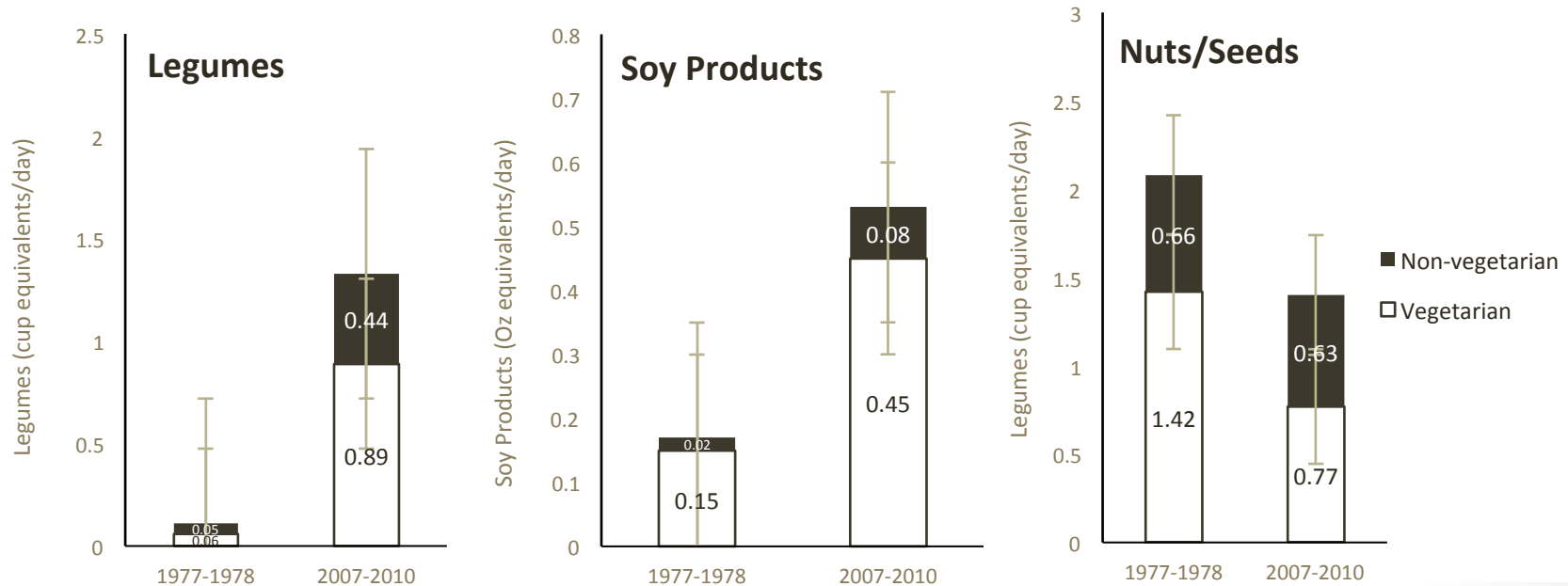


Figure 5. Soy, Legume, and Nuts/Seeds consumption by vegetarians and non-vegetarians in the United States, 1977—2010 (M +/- SE)

Conclusions

- **Vegetarians are more likely to be female, hold a college degree, $\leq 130\%$ FPL, and identify with an ethnicity other than NHW, NHB, and MA**
- **Healthful dietary pattern among vegetarians**
 - High in fruits, whole grains, soy products, legumes
 - Low in solid fats, poultry, and red meat
- **Healthful shifts in dietary pattern among veg & non-veg**
 - Veg: increased soy & dairy
 - Veg & non-veg: increased fruit, legume & poultry, decreased solid fats
- **Less healthful shifts in dietary patterns among veg & non-veg**
 - Veg & non-veg: increased red meat, decreased whole grains
 - Veg: decreased eggs, nuts/seeds

Strengths/Limitations

Strengths

- Use of two large, nationally representative samples of vegetarians and non-vegetarians from 1977-2010

Limitations

- Small sample size of vegetarians in both survey years
- Single 24-hour recall may not represent usual dietary pattern of participants, missing episodically consumed foods
- Misreporting of foods, biased by gender, weight status, etc.

References

1. Messina, V.K. and K.I. Burke, *Position of the American dietetic association: Vegetarian diets*. Journal of the American Dietetic Association, 1997. **97**(11): p. 1317-1321.
2. Scientific Report of the 2015 Dietary Guidelines Advisory Committee. 2015; Available from: <http://health.gov/dietaryguidelines/2015-scientific-report/>.
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