Macronutrients and Health: A Focus on Diabetes

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March 8, 2019
Changes in Prevalence of Overweight/Obesity from 1980 to 2012

Global Death Ranks and Percent Change for Top 25 Causes in 1990 and 2010

Chronic Illnesses Among Adult Hannahville Indians

### TABLE V

**CHRONIC ILLNESSES AMONG ADULT HANNAHVILLE INDIANS**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Hannahville Indians</th>
<th>General American Adult Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number with Condition</td>
<td>Percent with Condition</td>
</tr>
<tr>
<td><strong>N = 39</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of TB</td>
<td>7</td>
<td>17.9%</td>
</tr>
<tr>
<td>Obesity</td>
<td>14*</td>
<td>42.4%</td>
</tr>
<tr>
<td>History of GI Ulcer</td>
<td>5</td>
<td>12.8%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>4</td>
<td>10.3%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>8</td>
<td>20.5%</td>
</tr>
</tbody>
</table>

*Data on weight is available on 84.6% (33 of 39) of adult Indians.*

Nurse’s Health Study

In the Nurse’s Health Study (n=121,700)

- OCS
- Smoking
- Weight/Ht
- Med Hx

Health Professionals Follow-up Study (n=52,000)

- Diet
- Nails
- Diet
- Blood
- Diet
- Urine
- Diet
- Diet
- Diet

Nurses’ Health Study II (n=116,000)

- Diet
- Diet
- Blood
- Diet
- Diet
- Blood
- Diet
- Urine
- Diet

Investigators: Frank Speizer, Bernie Rosner, Meir Stampfer, Graham Colditz, David Hunter, JoAnn Manson, Sue Hankinson, Eric Rimm, Edward Giovannucci, Alberto Ascherio, Gary Curhan, Charles Fuchs, Fran Grodstein, Michelle Holmes, Donna Spiegelman, Frank Hu, Heather Eliassen, Lorelei Mucci
First Food Frequency Questionnaire

For each food listed, fill in the circle indicating how often on average you have used the amount specified during the past year.

<table>
<thead>
<tr>
<th>DAIRY FOODS</th>
<th>AVERAGE USE LAST YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skim or low fat milk (8 oz. glass)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Whole milk (8 oz. glass)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Cream, e.g. coffee, whipped (Tbs)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Sour cream (Tbs)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Non-dairy coffee whitener (tsp.)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Sherbet or ice milk (½ cup)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Ice cream (½ cup)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Yogurt (1 cup)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Cottage or ricotta cheese (½ cup)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Cream cheese (1 oz.)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Other cheese, e.g. American, cheddar, etc., plain or as part of a dish (1 slice or 1 oz. serving)</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Margarine (pat.), added to food or bread; exclude use in cooking</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Butter (pat.), added to food or bread; exclude use in cooking</td>
<td>0 0 0 0 0 0 0</td>
</tr>
</tbody>
</table>
Body Mass Index and Risk of Diabetes

Changes in Food and Beverage Consumption and Weight Changes Every 4 Years According to Study Cohort

Changes in Diet and Physical Activity and Weight Changes Within each Four-year Period in Three Cohorts

(Mozaffarian D et al., NEJM 2011)
Multivariate Relative Risks of Type 2 Diabetes According to Quintiles of Specific Types of Dietary Fat (Mutually Adjusted)

Types of Carbohydrates and Insulin Response

Willett, EDBH, 2001
Glycemic Load = Glycemic Index x Carbohydrate (CHO)
Relative Risk and Cereal Fiber Intake

Results: Joint Effects of Glycemic Index and Cereal Fiber in the Nurses’ Health Study II


(RRs multivariate and diet adjusted)
Meta-analysis of Glycemic Index and Diabetes, High vs. Low Intake

Effect of Acarbose and Placebo on Cumulative Probability of Remaining Free of Diabetes Over Time

Regular Soft Drinks and Type 2 Diabetes, NHS2

(Schulze et al. 2004 JAMA)
Meta-analysis of Prospective Studies on Sugar-sweetened Beverages and Type 2 Diabetes Risk

Traditional and Modern Corn

Courtesy of Target.com and Pioneer Seeds
Percentage of Type 2 Diabetes Potentially Preventable by Simultaneous Reduction of Five Modifiable Risk Factors (NHS)

Low Risk

1. Nonsmoking
2. BMI < 25
3. Moderate to vigorous exercise
4. Diet score in upper 40% (low trans fat, high cereal fiber, low glycemic load, high P:S ratio)
5. Alcohol 5+ grams/day

Percent in low risk group: 4.1%
Population attributable risk (PAR): 92% (82–96)

(Hu et al.)
Cumulative Incidence of Diabetes According to Study Group

Figure 2. Cumulative Incidence of Diabetes According to Study Group.
The diagnosis of diabetes was based on the criteria of the American Diabetes Association. The incidence of diabetes differed significantly among the three groups (P < 0.001 for each comparison).
Relative Risk of Type 2 Diabetes for Substitution of Specific Fruits (3 Servings per Week) for Fruit Juice

(Muraki, I., et al. “Fruit consumption and risk of type 2 diabetes: results from three prospective longitudinal cohort studies” BMJ 2013; 347 https://doi.org/10.1136/bmj.f5001)
Relation of Red Meat to Risk of Type 2 Diabetes in NHS, NHSII, and HPFS
(204,156 men and women, 13,759 incident cases)

**Servings are average for 3 cohorts, considering 85 g/svg (3%)**


Coffee Consumption and Risk of Type 2 Diabetes in U.S. Women

RR of Type 2 Diabetes Adjusted for BMI and Dietary and Lifestyle Variables

(Shai, I., “Ethnicity, Obesity, and Risk of Type 2 Diabetes in Women: A 20-year follow-up study.” Diabetes Care, 2006)
Conclusions

- Type 2 diabetes is rapidly increasing throughout the world
- Type 2 diabetes is almost entirely preventable by modification of known risk factors
- Modifying these risk factors will require layers of behavioral and policy changes at all levels, but this must be a high national and international priority