Adventist Health Study-2

Gary E. Fraser

Update on AHS-2

6th ICVN
Feb 24, 2013
Adventist Health Studies
Comparison between vegetarian dietary patterns: Nutrients

Nico Rizzo et al
Expressed as a % difference from the Non-vegetarian value (zero)
Expressed as a % difference from the Non-vegetarian value (zero)
Expressed as a % difference from the Non-vegetarian value (zero)
Cardiovascular Risk Factors and Diet—Non-Black Subjects

Synnove Knutsen & Jing Fan
BMI According to Vegetarian Category

- Vegans: 23.6
- Lacto-ovo vegetarians: 25.7
- Pesco-vegetarians: 26.3
- Semi-vegetarians: 27.3
- Non-vegetarians: 28.8

5 kg/m²
Weight Differences Between Vegetarians and Non-Vegetarians

Vegan  Lacto-ovo  Pesco-veg  Semi-veg  Non-veg

Pounds

Female  5’ 6” tall

Male  5’ 10” tall
Hypertension* Prevalence

* BP ≥ 140/90 or on hypertension medication
Diabetes* Incidence (Adjusted for BMI)  Whole cohort, but self-reported

* Self-reported new diabetes
Diabetes* Prevalence
(Not adjusted for BMI)

* Fasting glucose ≥ 126 mg/dl or on diabetic medication
Diabetes* Prevalence (Adjusted for BMI)

* Fasting glucose ≥ 126 mg/dl or on diabetic medication
High-cholesterol* Prevalence  
(Not adjusted for BMI)

* Blood cholesterol ≥ 240 mg/dl or on lipid medication
High-cholesterol* Prevalence  
(Adjusted for BMI)

* Blood cholesterol ≥ 240 mg/dl or on lipid medication
High-LDL-cholesterol* Prevalence
(Not adjusted for BMI)

* LDL ≥ 130 mg/dl or on lipid medication
High-LDL-cholesterol* Prevalence
(Adjusted for BMI)

* LDL ≥ 130 mg/dl or on lipid medication
Cardiovascular Risk Factors & Diet in Black Subjects

Gary Fraser, Patti Herring & Jing Fan
BMI* Prevalence

* p value tests hypothesis of no difference from non-vegetarian
* $p$ value tests hypothesis of no difference from non-vegetarian
Hypertension* Prevalence

* Bp > 140/90 or on anti-hypertension therapy
High Cholesterol* Prevalence

* Blood cholesterol ≥ 240 mg/dl or on lipid medication
High LDL Cholesterol Prevalence

* LDL ≥ 130 mg/dl or on lipid medication
* Fasting glucose ≥ 126 mg/dl or on diabetic medication
Diabetes* Incidence (Adjusted for BMI)  Whole cohort, but self-reported

* Self-reported new diabetes
Factors That May Mediate Cancer Risk
Karen Jaceldo et al
Mean BMI (kg/m²) by Dietary Pattern: Calibration and BioMRS Studies

- Vegan
- Lacto
- Pesco
- Semi
- Non-vege

*p < 0.0001
Mean CRP (mg/L) by Dietary Pattern

p values test differences from non-vegetarians

<table>
<thead>
<tr>
<th>Dietary Pattern</th>
<th>Mean CRP (mg/L)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegan</td>
<td></td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Lacto</td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Pesco/Semi</td>
<td></td>
<td>0.06</td>
</tr>
<tr>
<td>Non-Vegetarian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary Pattern</td>
<td>Mean CRP (mg/L)</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Vegan</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Lacto</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Pesco/Semi</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Non-Vegetarian</td>
<td>2.0</td>
<td></td>
</tr>
</tbody>
</table>

Only vegans still significant (p=0.02)
Mean Insulin (µU/ml) by Dietary Pattern

For all vegetarian categories p<0.01
p values test differences from non-vegetarians
Mean Insulin (uU/ml) by Dietary Pattern with BMI adjustment

Vegan and pesco/semi still differ significantly from non-vegetarian, but less so.
Vegan ($p = 0.84$)

Lacto ($p = 0.04$)

Pesco/Semi ($p = 0.11$)

Non-Vegetarian

Mean IGF-1 (ng/mL) by Dietary Pattern

No vegetarian categories differ significantly from non-vegetarians.
Mean IGF-1 (ng/ml) by Dietary Pattern with BMI adjustment

No vegetarian categories differ significantly from non-vegetarian. Vegans (p=0.27)
Mean IGFBP3 (ng/mL) by Dietary Pattern

Lacto and pesco/semi differ significantly from non-vegetarians.

- Vegan (p = 0.54)
- Lacto (p = 0.02)
- Pesco/Semi (p < 0.0001)
- Non-Vegetarian
Mean IGFBP3 (ng/ml) by Dietary Pattern with BMI adjustment

Lacto's and pesco/semi differ significantly from non-vegetarians.
Why Study BMI and Mortality in Seventh-day Adventists?

Pramil Singh et al
✔ Less bias in the risk estimates.

Adventist Health Study data from 1960 to 2002 indicate that:

1) Leaner SDAs tend to:
   - Follow a plant based diet
   - Vigorous physical activity regimen

2) Very low prevalence of cigarette smoking
Linking BMI and Plant-based Diets in AHS-2

Vegans: 23.6
Lacto-ovo vegetarians: 25.7
Pesco-vegetarians: 26.3
Semi-vegetarians: 27.3
Non-vegetarians: 28.8

5 kg/m^2

Diabetes Care, 2009
29 year follow-up of White SDA’s in AHS-1

Hazard Ratio for Death

Journal of American Geriatric Society, 2011
Better Survival for the Lean through at least the 9th Decade!
Findings: *Does excess body fat remain a risk factor in the elderly?*

Among Very Old (75-99 year-old) adults, we found that:

A BMI > 22 was associated with a significant 3.7 year decrease in life expectancy in men of AHS-1.

A BMI > 27 was associated with a significant 2.1 year decrease in life expectancy in women of AHS-1.
6 years of follow-up of Black SDA’s in AHS-2 (Submitted, 2012)
Findings: *Is obesity a risk factor for early death in Blacks in AHS-2?*

**Across the life-span:**

Obesity was associated with a significant **5.9 year decrease** in life expectancy in Black men of AHS-2.

Obesity was associated with a significant **6.2 year decrease** in life expectancy in Black women of AHS-2.

Obesity-related Risk was evident through at least the ninth decade of life.
Dietary Patterns and the Incidence of Overall Cancer in a Low-Risk Population

Yessenia Tantamango-Bartley, et al
Methodology

• Prospective cohort study
• Follow-up: 285,978 person-years
• Cancer cases identified by computer-matching of AHS-2 study members to state tumor registries
• System-specific cancer: GI, Respiratory, Urinary, Male-specific, Female-specific
• Cox-proportional hazard ratio
## Overall cancers and system-specific cancers

<table>
<thead>
<tr>
<th>Cancer</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gastrointestinal</strong> (esophagus, stomach, small intestine, colon, liver and bile ducts, gallbladder, biliary tract, pancreas)</td>
<td>495</td>
</tr>
<tr>
<td><strong>Respiratory</strong> (nasal cavity, middle ear, larynx, trachea, bronchus, lung, heart, mediastinum, and pleura)</td>
<td>170</td>
</tr>
<tr>
<td><strong>Urinary</strong> (renal pelvis, ureter, kidney, and bladder)</td>
<td>194</td>
</tr>
<tr>
<td><strong>Male-specific</strong> (prostate, penis and testis)</td>
<td>556</td>
</tr>
<tr>
<td><strong>Female-specific</strong> (female breast, vulva, vagina, cervix uteri, corpus uteri, endometrial, uterus, ovary)</td>
<td>805</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2939</td>
</tr>
</tbody>
</table>
Multivariate adjusted hazard ratio (HR) of the association between vegetarian status and specific dietary patterns and overall cancer incidence
Multivariate adjusted hazard ratio for both males and females

HR adjusted by race, family history, education, smoking, alcohol, age at menarche, pregnancies, breastfeeding, oral contraceptives, hormone replacement therapy, and menopause status.
HR adjusted by race, family history, education, smoking, alcohol, age at menarche, pregnancies, breastfeeding, oral contraceptives, hormone replacement therapy, and menopause status.
Multivariate adjusted hazard ratio for Males

HR adjusted by race, family history, education, smoking, and alcohol
Multivariate adjusted hazard ratio of anatomical cancer sites associated with vegetarian status and specific dietary patterns
HR adjusted by race, family history, education, smoking, alcohol, age at menarche, pregnancies, breastfeeding, oral contraceptives, hormone replacement therapy, and menopause status.
Respiratory System

HR adjusted by race, family history, education, smoking, alcohol, age at menarche, pregnancies, breastfeeding, oral contraceptives, hormone replacement therapy, and menopause status.
HR adjusted by race, family history, education, smoking, alcohol, age at menarche, pregnancies, breastfeeding, oral contraceptives, hormone replacement therapy, and menopause status.
Male-Specific Cancers

HR adjusted by race, family history, education, smoking, and alcohol.
Female-Specific Cancers

HR adjusted by race, family history, education, smoking, alcohol, age at menarche, pregnancies, breastfeeding, oral contraceptives, hormone replacement therapy, and menopause status.
Conclusions

• Vegan diets may decrease the incidence of all cancers combined, and specifically the risk of female-specific cancers when compared with non-vegetarians.

• Vegetarians as a combined group have lower risk of all cancers and gastrointestinal cancers than meat-eaters.
Diet and Mortality

Michael Orlich et al
Table 2. Age-sex-race standardized mortality rates among 77,588 Adventist Health Study 2 participants according to diet pattern.

<table>
<thead>
<tr>
<th>Diet Pattern</th>
<th>N</th>
<th>Person-time (years)</th>
<th>Mean time (years)</th>
<th>Deaths</th>
<th>Death rate (deaths/1000 person-years)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegans</td>
<td>5918</td>
<td>34382.3</td>
<td>5.81</td>
<td>197</td>
<td>5.08</td>
<td>4.37, 5.80</td>
</tr>
<tr>
<td>Lacto-ovo vegetarians</td>
<td>22103</td>
<td>128027.1</td>
<td>5.80</td>
<td>823</td>
<td>5.53</td>
<td>5.14, 5.92</td>
</tr>
<tr>
<td>Pesco vegetarians</td>
<td>7754</td>
<td>43403.7</td>
<td>5.60</td>
<td>250</td>
<td>5.09</td>
<td>4.44, 5.73</td>
</tr>
<tr>
<td>Semi vegetarians</td>
<td>4253</td>
<td>24460.3</td>
<td>5.75</td>
<td>164</td>
<td>5.83</td>
<td>4.90, 6.75</td>
</tr>
<tr>
<td>Non vegetarians</td>
<td>37560</td>
<td>211051.6</td>
<td>5.62</td>
<td>1167</td>
<td>6.47</td>
<td>6.09, 6.85</td>
</tr>
<tr>
<td>Total</td>
<td>77588</td>
<td>441324.8</td>
<td>5.69</td>
<td>2601</td>
<td>5.89</td>
<td>5.67, 6.12</td>
</tr>
</tbody>
</table>

Abbreviations: N, number of people; CI, confidence interval.
<table>
<thead>
<tr>
<th></th>
<th>All-cause</th>
<th>IHD</th>
<th>CVD</th>
<th>Cancer</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>All (n=73,308)(^a,b)</td>
<td>(2560 deaths)</td>
<td>(372 deaths)</td>
<td>(987 deaths)</td>
<td>(706 deaths)</td>
<td>(867 deaths)</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.88 (0.80, 0.97)</td>
<td>0.81 (0.64, 1.02)</td>
<td>0.87 (0.75, 1.01)</td>
<td>0.92 (0.78, 1.08)</td>
<td>0.85 (0.73, 0.99)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Men (n=25,105)(^a)</td>
<td>(1031 deaths)</td>
<td>(169 deaths)</td>
<td>(390 deaths)</td>
<td>(273 deaths)</td>
<td>(368 deaths)</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.82 (0.72, 0.94)</td>
<td>0.71 (0.51, 1.00)</td>
<td>0.71 (0.57, 0.90)</td>
<td>1.02 (0.78, 1.32)</td>
<td>0.83 (0.66, 1.04)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Women (n=48,203)(^a,c)</td>
<td>(1529 deaths)</td>
<td>(203 deaths)</td>
<td>(597 deaths)</td>
<td>(433 deaths)</td>
<td>(499 deaths)</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.93 (0.82, 1.05)</td>
<td>0.88 (0.65, 1.20)</td>
<td>0.99 (0.83, 1.18)</td>
<td>0.87 (0.71, 1.07)</td>
<td>0.88 (0.72, 1.08)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Abbreviations: IHD, ischemic heart disease; CVD, cardiovascular disease; HR, hazard ratio; CI, confidence interval;
\(^a\) Adjusted by age (i.e. attained age as time variable), race (black, non-black), smoking, exercise, income, education, marital status, alcohol, region (West, Northwest, Mountain, Midwest, East, South), and sleep;
\(^b\) Also adjusted by sex (male, female), menopause (in women) (premenopausal [including perimenopausal], postmenopausal), and hormone replacement (in postmenopausal women) (not taking hormone replacement, taking hormone replacement);
\(^c\) Also adjusted by menopause (premenopausal [including perimenopausal], postmenopausal) and hormone replacement (in postmenopausal women) (not taking hormone replacement, taking hormone replacement).
Table 4. Associations of dietary patterns with all-cause and cause-specific mortality from a Cox proportional hazards model among participants in the Adventist Health Study 2, 2002–2009.

<table>
<thead>
<tr>
<th></th>
<th>All-cause HR (95% CI)</th>
<th>IHD HR (95% CI)</th>
<th>CVD HR (95% CI)</th>
<th>Cancer HR (95% CI)</th>
<th>Other HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All (n=73,308)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegan</td>
<td>0.85 (0.73, 1.01)</td>
<td>0.90 (0.60, 1.33)</td>
<td>0.91 (0.71, 1.16)</td>
<td>0.92 (0.68, 1.24)</td>
<td>0.74 (0.56, 0.99)</td>
</tr>
<tr>
<td>Lacto-ovo vegetarian</td>
<td>0.91 (0.82, 1.00)</td>
<td>0.82 (0.62, 1.06)</td>
<td>0.90 (0.76, 1.06)</td>
<td>0.90 (0.75, 1.09)</td>
<td>0.91 (0.77, 1.07)</td>
</tr>
<tr>
<td>Pesco vegetarian</td>
<td>0.81 (0.69, 0.94)</td>
<td>0.65 (0.43, 0.97)</td>
<td>0.80 (0.62, 1.03)</td>
<td>0.94 (0.72, 1.22)</td>
<td>0.71 (0.54, 0.94)</td>
</tr>
<tr>
<td>Semi vegetarian</td>
<td>0.92 (0.75, 1.13)</td>
<td>0.92 (0.57, 1.51)</td>
<td>0.85 (0.63, 1.16)</td>
<td>0.94 (0.66, 1.35)</td>
<td>0.99 (0.72, 1.36)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Men (n=25,105)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegan</td>
<td>0.72 (0.56, 0.92)</td>
<td>0.45 (0.21, 0.94)</td>
<td>0.58 (0.38, 0.89)</td>
<td>0.81 (0.48, 1.36)</td>
<td>0.81 (0.53, 1.22)</td>
</tr>
<tr>
<td>Lacto-ovo vegetarian</td>
<td>0.86 (0.74, 1.01)</td>
<td>0.76 (0.52, 1.12)</td>
<td>0.77 (0.59, 0.99)</td>
<td>1.01 (0.75, 1.37)</td>
<td>0.89 (0.69, 1.15)</td>
</tr>
<tr>
<td>Pesco vegetarian</td>
<td>0.73 (0.57, 0.93)</td>
<td>0.77 (0.45, 1.30)</td>
<td>0.66 (0.44, 0.98)</td>
<td>1.10 (0.73, 1.67)</td>
<td>0.60 (0.39, 0.93)</td>
</tr>
<tr>
<td>Semi vegetarian</td>
<td>0.93 (0.68, 1.26)</td>
<td>0.73 (0.33, 1.60)</td>
<td>0.75 (0.43, 1.32)</td>
<td>1.15 (0.65, 2.03)</td>
<td>1.03 (0.62, 1.71)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Women (n=48,203)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegan</td>
<td>0.97 (0.78, 1.20)</td>
<td>1.39 (0.87, 2.24)</td>
<td>1.18 (0.88, 1.60)</td>
<td>0.99 (0.69, 1.44)</td>
<td>0.70 (0.47, 1.05)</td>
</tr>
<tr>
<td>Lacto-ovo vegetarian</td>
<td>0.94 (0.83, 1.07)</td>
<td>0.85 (0.59, 1.22)</td>
<td>0.99 (0.81, 1.22)</td>
<td>0.85 (0.67, 1.09)</td>
<td>0.93 (0.75, 1.17)</td>
</tr>
<tr>
<td>Pesco vegetarian</td>
<td>0.88 (0.72, 1.07)</td>
<td>0.51 (0.26, 0.99)</td>
<td>0.90 (0.66, 1.23)</td>
<td>0.86 (0.61, 1.21)</td>
<td>0.81 (0.58, 1.15)</td>
</tr>
<tr>
<td>Semi vegetarian</td>
<td>0.92 (0.70, 1.22)</td>
<td>1.09 (0.60, 1.98)</td>
<td>0.93 (0.64, 1.34)</td>
<td>0.85 (0.56, 1.30)</td>
<td>0.97 (0.64, 1.47)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Table 5. Comparison of vegetarian to non vegetarian dietary patterns with respect to categories of non-cancer, non-cardiovascular mortality from a Cox proportional hazards model among participants in the Adventist Health Study 2, 2002–2009.

<table>
<thead>
<tr>
<th>Category</th>
<th>Infectious&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Neurological&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Respiratory&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Renal&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Endocrine&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>All (n=73,308)&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>(64 deaths)</td>
<td>(182 deaths)</td>
<td>(172 deaths)</td>
<td>(67 deaths)</td>
<td>(104 deaths)</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.93 (0.53, 1.62)</td>
<td>0.93 (0.67, 1.29)</td>
<td>0.95 (0.68, 1.32)</td>
<td>0.48 (0.28, 0.82)</td>
<td>0.61 (0.40, 0.92)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Men (n=25,105)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>(31 deaths)</td>
<td>(80 deaths)</td>
<td>(72 deaths)</td>
<td>(34 deaths)</td>
<td>(41 deaths)</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.85 (0.39, 1.86)</td>
<td>0.86 (0.53, 1.40)</td>
<td>1.13 (0.67, 1.92)</td>
<td>0.42 (0.19, 0.91)</td>
<td>0.48 (0.25, 0.92)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Women (n=48,203)&lt;sup&gt;b,d&lt;/sup&gt;</td>
<td>(33 deaths)</td>
<td>(102 deaths)</td>
<td>(100 deaths)</td>
<td>(33 deaths)</td>
<td>(63 deaths)</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.97 (0.44, 2.11)</td>
<td>0.97 (0.63, 1.49)</td>
<td>0.88 (0.57, 1.36)</td>
<td>0.57 (0.28, 1.19)</td>
<td>0.76 (0.44, 1.30)</td>
</tr>
<tr>
<td>Non vegetarian</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Summary--Diet Patterns & Mortality

• Vegetarians (taken together) appear to show a significant reduction in mortality compared to non vegetarians—about a 12% relative reduction

• Vegans & Pesco vegetarians may fare somewhat better overall than lacto-ovo vegetarians

• Both pesco-vegetarian and vegan advantages are concentrated among renal and diabetes deaths. In addition, pesco- (and lacto-ovo-) vegetarians, but not vegans, have less IHD than non-vegetarians.
Diet Patterns & Mortality

• The “protective effect“ of vegetarianism seems stronger and more statistically robust in men, but there are suggestions of effect in women also.

• “Protection” seems greatest for cardiovascular, endocrine and renal mortality.

• We do not yet see statistically significant differences yet for cancer mortality.
- Adventists span a wide variety of diets
- About 25% of AHS-2 subjects are Black
- The vegetarians have:
  a) Much lower BMI
  b) Less hypertension
  c) Less diabetes
  d) Lower blood glucose and diabetes
  e) Lower blood cholesterol
  f) Lower CRP, insulin, IFGBP3
o Lower BMI in Adventists (”healthy lower”) is associated with reduced mortality across the lifespan

o Vegetarianism associated with moderately lower total mortality, CHD mortality, renal, and endocrine mortality

o Vegetarians have less cancer, especially G-I, female organs, and possibly respiratory

o Most of the risk factor associations, and BMI/Mortality effects are also evident in Black subjects
Adventist Health Studies