Session 081 PD - Why Cover Expensive Medical Treatments That Don't Work?

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Carl Turissini, MD
Why cover expensive medical treatments that don't work?

RUSS OSBORN, FSA, CFA, CERA
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October 17, 2017
How do we decide if a treatment “works”?

• Increase in expected life span
• Cost-effectiveness
  • Cost per QALY (Quality-Adjusted Life Years)
• Eliminates the root cause of the condition
What is a reasonable threshold for cost-effectiveness?

“Originally proposed by Weinstein and Zeckhauser, a … solution to the cost–effectiveness standard problem is to cite the cost–effectiveness of a benchmark intervention that has already been adopted in the relevant country and to use that as a threshold for acceptable cost–effectiveness. ... This threshold is established by a retrospective analysis of existing practice. In the USA, for example, a threshold still used in cost–effectiveness analyses – US$ 50 000 per QALY gained – was based on an estimate of the cost–effectiveness of dialysis for chronic renal disease. This threshold has recently been updated to US$ 100 000 or US$ 150 000 per QALY gained. ... There is already evidence of a willingness to pay US$ 150 000 per QALY gained.”


**Thresholds for the cost–effectiveness of interventions: alternative approaches**

Elliot Marseille, Bruce Larson, Dhruv S. Kazi, James G. Kahn & Sydney Rosen
To Discuss

• Heart Disease Treatments
  • Bypass surgery
  • Angioplasties
  • Stents
  • Lifestyle interventions

• Diabetes Treatments

• Cancer Screenings & Treatments
Bypass surgery

• Cost-effective only in high-risk/severe symptom patients
• Still expensive
• High risk of recurrence of cardiac events
• Does it address the cause?
• Are there cheaper ways that address the cause and prevent recurrence?

VD = vessel disease
(# indicates how many vessels)
LMD = left main disease
Angioplasties & Stents

• Similar picture, but complex
• Cost-effective in some cases, under certain conditions
• Still expensive
• High risk of recurrence of cardiac events
• Do not address the cause
• Are there cheaper ways that address the cause and prevent recurrence?
Heart Disease: Lifestyle Intervention

• Randomized controlled trial (1986-1992) using a randomized invitational design
• Objectives:
  • Determine feasibility of patients to sustain intensive lifestyle changes for a total of 5 years
  • Determine effects of these lifestyle changes (w/o lipid-lowering drugs) on coronary heart disease
• Results:

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program (“Treatment”)</td>
<td>Made &amp; maintained comprehensive lifestyle changes for 5 years</td>
<td>Made more moderate changes</td>
</tr>
<tr>
<td># Completed 5-year Follow-Up / # Began</td>
<td>20 / 28 (71%)</td>
<td>15 / 20 (75%)</td>
</tr>
<tr>
<td>Avg % Change in Diameter Stenosis (after 1 year)</td>
<td>1.75% absolute decrease (4.5% relative improvement)</td>
<td>2.3% absolute increase (5.4% relative worsening)</td>
</tr>
<tr>
<td>Avg % Change in Diameter Stenosis (after 5 year)</td>
<td>3.1% absolute decrease (7.9% relative improvement)</td>
<td>11.8% absolute increase (27.7% relative worsening)</td>
</tr>
<tr>
<td>Cardiac events during the 5 years</td>
<td>25 events (among 28 patients)</td>
<td>45 events (among of 20 patients)</td>
</tr>
</tbody>
</table>

Dean Ornish, Larry W. Scherwitz, James H. Billings et al.
Diabetes

• “Costs of treatments for the primary prevention of type 2 diabetes range from <$1,000 to approximately $20,000 per QALY-gained”
Diabetes: Effective treatments

• Diabetes was delayed or prevented by interventions {diet, exercise and pharmacological therapy} vs control (risk ratio 0.83, 95% CI 0.80-0.86). Non-drug approaches were superior to drug-based approaches in diabetes prevention
  

• Lifestyle changes and treatment with metformin both reduced the incidence of diabetes in persons at high risk. The lifestyle intervention was more effective than metformin. There was zero diabetes among the 49 subjects who best conformed to the goals of the prescribed lifestyle changes (mean follow-up duration: 3.2 years)
  
Cancer Screenings & Treatments

• Depending on the type of cancer, the method of screening, and the frequency of screening, screening + conventional treatment can be cost-effective
  • Not the case for prostate cancer
• Still very expensive
• Do these approaches address the cause?
• Are there cheaper ways that address the cause and significantly reduce risk?
Wrap-Up

• Lifestyle interventions work superiorly (when properly designed and adhered to); furthermore, they address root causes

• Standard medical procedures for leading diseases/causes of death, while sometimes “cost-effective” by common thresholds, are quite expensive and fail to address root causes

• Why are lifestyle inventions not used more often?
  • Unwilling patients (“too hard”)
  • Unwilling doctors (“too hard” to convince patients or not convinced themselves)
  • Uninformed doctors

• 1998 Ornish study showed that it is possible

• Given the high costs of standard medical treatments, there is potentially a lot of money to work with to engage with patients on lifestyle/wellness approaches
Why Cover Expensive Medical Treatments That Don’t Work?

Benefits of Whole Food Plant based diet

Carl Turissini, M.D, FACC
October 17, 2017
Disclosures
Conflicts of interest

None
Mortality and Economic Cost of Medical Intervention

Table 1: Estimated Annual Mortality and Economic Cost of Medical Intervention

<table>
<thead>
<tr>
<th>Condition</th>
<th>Deaths</th>
<th>Cost</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Drug Reactions</td>
<td>106,000</td>
<td>$12 billion</td>
<td>Lazarou(1), Suh (49)</td>
</tr>
<tr>
<td>Medical error</td>
<td>98,000</td>
<td>$2 billion</td>
<td>IOM(6)</td>
</tr>
<tr>
<td>Bedsores</td>
<td>115,000</td>
<td>$55 billion</td>
<td>Xakellis(7), Barczak (8)</td>
</tr>
<tr>
<td>Infection</td>
<td>88,000</td>
<td>$5 billion</td>
<td>Weinstein(9), MMWR (10)</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>108,800</td>
<td>----------</td>
<td>Nurses Coalition(11)</td>
</tr>
<tr>
<td>Outpatients</td>
<td>199,000</td>
<td>$77 billion</td>
<td>Starfield(12), Weingart(112)</td>
</tr>
<tr>
<td>Unnecessary Procedures</td>
<td>37,136</td>
<td>$122 billion</td>
<td>HCUP(3,13)</td>
</tr>
<tr>
<td>Surgery-Related</td>
<td>32,000</td>
<td>$9 billion</td>
<td>AHRQ(65)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>783,936</td>
<td><strong>$282 billion</strong></td>
<td></td>
</tr>
</tbody>
</table>
Death associated with 17 risk factors

**Risk Factors**
- Dietary risks
- Tobacco smoking
- High blood pressure
- High body mass index
- Physical inactivity and low physical activity
- High fasting plasma glucose
- High total cholesterol
- Ambient particulate matter pollution
- Alcohol use
- Drug use
- Lead exposure
- Occupational risks
- Low bone mineral density
- Residential radon
- Ambient ozone pollution
- Intimate partner violence
- Childhood sexual abuse

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JAMA August 14, 2013 Vol. 310 (6)
Disability percentage associated with 17 risk factors

Risk factors as a percentage of disability-adjusted life-years

- Dietary risks
- Tobacco smoking
- High body mass index
- High blood pressure
- High fasting plasma glucose
- Physical inactivity and low physical activity
- Alcohol use
- High total cholesterol
- Drug use
- Ambient particulate matter pollution
- Occupational risks
- Childhood sexual abuse
- Intimate partner violence
- Lead exposure
- Low bone mineral density
- Residential radon
- Ambient ozone pollution

Disability-Adjusted Life-Years, %

- Diseases and injuries
  - Intentional injuries
  - Unintentional injuries
  - Transport injuries
- Other noncommunicable
  - Musculoskeletal disorders
  - Diabetes/urogenital/blood/endocrine
  - Mental and behavioral disorders
  - Neurological disorders
  - Digestive diseases
  - Cirrhosis
  - Chronic respiratory diseases
  - Cardiovascular and circulatory diseases
  - Cancer
- Other communicable
  - Nutritional deficiencies
  - Neonatal disorders
  - Maternal disorders
  - Neglected tropical diseases and malaria
  - Diarrhea/lower respiratory tract infections/other infections
  - HIV/AIDS and tuberculosis
Death from Heart disease and Stroke
Heart disease and Stroke Incidence
Diabetes incidence

New Cases of Diagnosed Diabetes Among U.S. Adults Aged 18–79 Years, 1980–2009

When low risk is actually high risk
Obesity Trends* Among US Adults
CDC’s Behavioral Risk Factor Surveillance System
1991-2003
(*BMI≥30, or ~ 30 lbs overweight for 5’4” women)
Obesity 2013-2014

• Obesity
  • 37.9% adults

• Overweight
  • 70.7% adults
Chauncy Morlan (1869-1906)
Chauncy Morlan (1869-1906)

Toured Europe and America with Barnum and Bailey Circus
The Additional Costs and Health Effects of a Patient Having Overweight or Obesity: A Computational Model

Saeideh Fallah-Fini1,2, Atif Adam1, Lawrence J. Cheskin1, Sarah M. Bartsch1, and Bruce Y. Lee 3

Objective: This paper estimates specific additional disease outcomes and costs that could be prevented by helping a patient go from an obesity or overweight category to a normal weight category at different ages. This information could help physicians, other health care workers, patients, and third-party payers determine how to prioritize weight reduction.

Methods: A computational Markov model was developed that represented the BMI status, chronic health states, health outcomes, and associated costs (from various perspectives) for an adult at different age points throughout his or her lifetime.

Results: Incremental costs were calculated for adult patients with obesity or overweight (vs. normal weight) at different starting ages. For example, for a metabolically healthy 20-year-old, having obesity (vs. normal weight) added lifetime third-party payer costs averaging $14,059 (95% range: $13,956-$14,163), productivity losses of $14,141 ($13,969-$14,312), and total societal costs of $28,020 ($27,751-$28,289); having overweight vs. normal weight added $5,055 ($4,967-$5,144), $5,358 ($5,199-$5,518), and $10,365 ($10,140-$10,590). For a metabolically healthy 50-year-old, having obesity added $15,925 ($15,831-$16,020), $20,120 ($19,887-$20,352), and $36,278 ($35,977-$36,579); having overweight added $5,866 ($5,779-$5,953), $10,205 ($9,980-$10,429), and $16,169 ($15,899-$16,438).

Conclusions: Incremental lifetime costs of a patient with obesity or overweight (vs. normal weight) increased with the patient's age, peaked at age 50, and decreased with older ages. However, weight reduction even in older adults still yielded incremental cost savings.

<table>
<thead>
<tr>
<th>Starting age of patient</th>
<th>Obesity vs. normal weight</th>
<th>Obesity vs. overweight</th>
<th>Overweight vs. normal weight</th>
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<tbody>
<tr>
<td>Third-party payer costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>$311 ($309-$314)*</td>
<td>$198 ($195-$200)</td>
<td>$114 ($112-$116)</td>
</tr>
<tr>
<td>30</td>
<td>$393 ($390-$396)</td>
<td>$238 ($235-$240)</td>
<td>$155 ($153-$158)</td>
</tr>
<tr>
<td>40</td>
<td>$589 ($585-$593)</td>
<td>$337 ($333-$341)</td>
<td>$252 ($248-$256)</td>
</tr>
<tr>
<td>50</td>
<td>$906 ($899-$912)</td>
<td>$462 ($455-$469)</td>
<td>$444 ($438-$450)</td>
</tr>
<tr>
<td>60</td>
<td>$1,106 ($1,098-$1,114)</td>
<td>$438 ($428-$449)</td>
<td>$668 ($659-$677)</td>
</tr>
<tr>
<td>70</td>
<td>$1,304 ($1,292-$1,315)</td>
<td>$344 ($328-$359)</td>
<td>$960 ($946-$974)</td>
</tr>
<tr>
<td>80</td>
<td>$1,386 ($1,371-$1,400)</td>
<td>$269 ($247-$291)</td>
<td>$1,117 ($1,097-$1,137)</td>
</tr>
<tr>
<td>Productivity losses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>$322 ($319-$326)</td>
<td>$197 ($193-$201)</td>
<td>$125 ($122-$128)</td>
</tr>
<tr>
<td>30</td>
<td>$423 ($418-$428)</td>
<td>$226 ($221-$231)</td>
<td>$197 ($192-$201)</td>
</tr>
<tr>
<td>40</td>
<td>$608 ($601-$706)</td>
<td>$310 ($302-$318)</td>
<td>$338 ($338-$396)</td>
</tr>
<tr>
<td>50</td>
<td>$1,267 ($1,255-$1,279)</td>
<td>$419 ($406-$433)</td>
<td>$847 ($834-$860)</td>
</tr>
<tr>
<td>60</td>
<td>$1,924 ($1,908-$1,942)</td>
<td>$406 ($383-$428)</td>
<td>$1,518 ($1,497-$1,540)</td>
</tr>
<tr>
<td>70</td>
<td>$2,487 ($2,461-$2,513)</td>
<td>$248 ($213-$283)</td>
<td>$2,239 ($2,206-$2,272)</td>
</tr>
<tr>
<td>80</td>
<td>$2,049 ($2,021-$2,077)</td>
<td>$0*</td>
<td>$2,089 ($2,048-$2,129)</td>
</tr>
<tr>
<td>Societal costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>$630 ($624-$636)</td>
<td>$391 ($385-$397)</td>
<td>$239 ($234-$244)</td>
</tr>
<tr>
<td>30</td>
<td>$804 ($797-$811)</td>
<td>$459 ($452-$467)</td>
<td>$335 ($339-$352)</td>
</tr>
<tr>
<td>40</td>
<td>$1,293 ($1,282-$1,303)</td>
<td>$650 ($638-$661)</td>
<td>$643 ($632-$654)</td>
</tr>
<tr>
<td>50</td>
<td>$2,176 ($2,159-$2,193)</td>
<td>$886 ($866-$904)</td>
<td>$1,291 ($1,274-$1,309)</td>
</tr>
<tr>
<td>60</td>
<td>$3,030 ($3,005-$3,055)</td>
<td>$836 ($804-$867)</td>
<td>$2,194 ($2,165-$2,224)</td>
</tr>
<tr>
<td>70</td>
<td>$3,806 ($3,772-$3,841)</td>
<td>$596 ($548-$644)</td>
<td>$3,210 ($3,164-$3,257)</td>
</tr>
<tr>
<td>80</td>
<td>$3,443 ($3,404-$3,481)</td>
<td>$235 ($175-$295)</td>
<td>$3,207 ($3,152-$3,263)</td>
</tr>
</tbody>
</table>

*Average (95% uncertainty interval).

*The 95% uncertainty interval contained zero and is thus not statistically significant.
Disconnect

• Survey 1,234 American adults
• 90% say their diet is healthy
  • 52% somewhat healthy
  • 32% very healthy
  • 5% extremely healthy

Consumer Reports Health, October 2105
Disconnect

• Survey 1,234 American adults
• 90% say their diet is healthy
  • 52% somewhat healthy
  • 32% very healthy
  • 5% extremely healthy
  • 0.5% actually met criteria for healthy diet

Gallop poll   November 2015
Disconnect

• Survey 1,234 American adults
• 90% say their diet is healthy
  • 52% somewhat healthy
  • 32% very healthy
  • 5% extremely healthy
• 0.5% actually met criteria for healthy diet
• Only 37% described themselves as overweight
## Influence of “Modern Agriculture”

<table>
<thead>
<tr>
<th>Year</th>
<th>Sugar (yearly per capita)</th>
<th>Animal (yearly per capita)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1830</td>
<td>15 pounds</td>
<td>Rare</td>
</tr>
<tr>
<td>1910</td>
<td>40 pounds</td>
<td>100 pounds</td>
</tr>
<tr>
<td>2007</td>
<td>160 pounds</td>
<td>220 pounds</td>
</tr>
</tbody>
</table>
The Standard American Diet
Chimpanzee--our closest relative

- Diversity
  - 102 species of plants
- Fruit
  - Figs
  - Clumps—one or two fruits on any day
- Meat
  - 9 days per year
  - <3% of total calories
- Termites and ants
  - Chitin exoskeleton

DP Watts, et al, Amer. J of Primatology, Volume 72, (2) Feb
Evolution
Modern Evolution
Coronary disease among soldiers killed in Korean war

• 300 autopsies
  • First 100 cases age was not recorded
  • Oldest patient was 33
• 200 autopsies with age recorded
  • Average age 22.1 years
• 77.3% had gross evidence of coronary disease
• 15.3% had > 50% stenosis

JAMA 1953;152(120): 100-93
Early Atherosclerosis is Present in Virtually All Americans


- 2876 subjects
- >50% ages 15-19 had fatty steaks
Bogalusa Study

• Longitudinal study children in Louisiana
• 100% of 10 year olds had coronary fatty streaks
• LDL cholesterol – number 1 risk factor

NEJM 1986 Jan 16;314(3) 138-44
If diet is so obvious...
REITERATION

Sick individuals and sick populations

Geoffrey Rose

Rose G (Department of Epidemiology, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK). Sick individuals and sick populations. *International Journal of Epidemiology* 1985;14:32–38.

Aetiology confronts two distinct issues: the determinants of individual cases, and the determinants of incidence rate. If exposure to a necessary agent is homogeneous within a population, then case/control and cohort methods will fail to detect it: they will only identify markers of susceptibility. The corresponding strategies in control are the ‘high-risk’ approach, which seeks to protect susceptible individuals, and the population approach, which seeks to control the causes of incidence. The two approaches are not usually in competition, but the prior concern should always be to discover and control the causes of incidence.

The Determinants of Individual Cases

To confine attention in this way to within-population comparisons has caused much confusion (particularly in the clinical...
Adventist Study
Compared with regular meat eaters

<table>
<thead>
<tr>
<th>Diet (n=31766)</th>
<th>Heart Disease</th>
<th>Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegans (n=753)</td>
<td>-26%</td>
<td>-30%</td>
</tr>
<tr>
<td>Lacto-ovo vegetarians (n=23,265)</td>
<td>-34%</td>
<td>-13%</td>
</tr>
<tr>
<td>Fish eaters (n=23750)</td>
<td>-34%</td>
<td>+4%</td>
</tr>
<tr>
<td>Occasional meat (&lt;1/week) (n=8135)</td>
<td>-20%</td>
<td>-3%</td>
</tr>
</tbody>
</table>

*Circulation. 1992; 86:406-13*
## Adventist 2 (2002-2009)

<table>
<thead>
<tr>
<th></th>
<th>All Cause</th>
<th>Ischemic heart</th>
<th>Cardiovasc disease</th>
<th>Cancer</th>
<th>Other</th>
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</thead>
<tbody>
<tr>
<td>All (73,308) deaths</td>
<td>2560</td>
<td>372</td>
<td>987</td>
<td>706</td>
<td>867</td>
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<tr>
<td>Vegetarian</td>
<td>0.88</td>
<td>0.81</td>
<td>0.87</td>
<td>0.92</td>
<td>0.85</td>
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<tr>
<td>Nonvegetarian</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Men Vegetarian</td>
<td>0.82</td>
<td>0.71</td>
<td>0.71</td>
<td>1.02</td>
<td>0.83</td>
</tr>
<tr>
<td>Men Nonvegetarian</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Women Vegetarian</td>
<td>0.93</td>
<td>0.88</td>
<td>0.99</td>
<td>0.87</td>
<td>0.88</td>
</tr>
<tr>
<td>Women Nonvegetarian</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Fig. 1—Mortality from circulatory diseases in Norway in 1927-48. Standard population = population of Norway in 1940.
Fig. 1—Mortality from circulatory diseases in Norway in 1927-48. Standard population = population of Norway in 1940.
Dean Ornish

- Near vegan diet
  - Very low fat diet
  - Stress management (meditation)
  - Exercise
  - Group therapy

- Results
  - 82% regression of heart disease
  - 91% decrease in angina
  - 50% reduction in cardiac events/4 years

Caldwell B. Esselstyn, Jr., M.D.

- 12 year longitudinal study
- 44 patients all with coronary disease
  - Majority on statins and aspirin
  - 20--standard diet
  - 24--Low fat, Plant based (6 dropped out)

- 8 years prior to study
  - 18 patients: 49 cardiac events

- 12 years follow up
  - Standard diet—45 events
  - Low fat, Plant based
Caldwell B. Esselstyn, Jr., M.D.

• 12 year longitudinal study
• 44 patients all with coronary disease
  • Majority on statins and aspirin
  • 20—standard diet
  • 24—Low fat, Plant based (6 dropped out)

• 8 years prior to study
  • 18 patients: 49 cardiac events

• 12 years follow up
  • Standard diet—45 events
  • Low fat, Plant based—0 events
<table>
<thead>
<tr>
<th>Patient</th>
<th>Total Cholesterol (mg/dl)</th>
<th>LDL (mg/dl)</th>
<th>HDL (mg/dl)</th>
<th>Triglycerides (mg/dl)</th>
<th>Total Cholesterol (mg/dl)</th>
<th>LDL (mg/dl)</th>
<th>HDL (mg/dl)</th>
<th>Triglycerides (mg/dl)</th>
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<tbody>
<tr>
<td>1</td>
<td>137</td>
<td>91</td>
<td>28</td>
<td>108</td>
<td>138</td>
<td>85</td>
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<tr>
<td>4</td>
<td>124</td>
<td>58</td>
<td>33</td>
<td>206</td>
<td>Deceased</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>110</td>
<td>65</td>
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<td>97</td>
<td>112</td>
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<td>6</td>
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<td>41</td>
<td>109</td>
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<td>77</td>
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<td>117</td>
<td>154</td>
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<td>155</td>
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<tr>
<td>8</td>
<td>150</td>
<td>63</td>
<td>32</td>
<td>362</td>
<td>161</td>
<td>77</td>
<td>30</td>
<td>351</td>
</tr>
<tr>
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<td>146</td>
<td>90</td>
<td>40</td>
<td>91</td>
<td>160</td>
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<tr>
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<td>44</td>
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<tr>
<td>Mean</td>
<td>137</td>
<td>76</td>
<td>39</td>
<td>143</td>
<td>145</td>
<td>82</td>
<td>38</td>
<td>143</td>
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</table>
Reversal of Coronary Disease Achieved with Plant-Based Diet

Coronary angiograms of the distal left anterior descending artery before (left bracket) and after (right bracket) 32 months of a plant-based diet without cholesterol-lowering medication, showing profound improvement. Used with permission from Dr. Caldwell B. Esselstyn, Jr. (Source: Prevent and Reverse Heart Disease by Dr. Esselstyn.)
Figure. Angiographic images of the distal right coronary artery in a 54-year-old male patient at baseline in 1987 (left) and in 1992 after 5 years on a very low-fat diet (right). The lesion regressed by more than 30% (1.21 mm).
Non randomized experience

• 226 patients
  • Coronary disease—196 (17 non compliant)
  • Primary prevention—30 (5 non compliant)

• Follow up 3.75 years
  • 17 non compliant—13 cardiac events
  • 179 compliant—1 event (stroke)
    • 97% had improvement or resolution of angina
    • 76% lost weight (average 18.6 lbs)
Recurrent Major Cardiac events

Percent incidence 4 years

- Lyon: 25%
- Nat history: 20%
- Courage: 15%
- Esselstyn: 0%

Nitric Oxide

• “Molecule of the Year”
• Nobel prize
• Vasodilatation (nitroglycerin)
• Inhibits:
  • smooth muscle contraction and growth
  • Platelet aggregation
  • Leukocyte adhesion
• Impaired:
  • Atherosclerosis, Diabetes, Hypertension
  • Animal protein and fat
Brachial artery tourniquet test

• Indirect measure of Nitric oxide
• Impaired by single fatty meal
  • Stayed impaired for > 12 hours

Gut bacteria

• **L-Carnitine**
  • Non essential amino acid
  • Found in all meats & eggs
    • Red meat more than chicken & fish
  • Converted to TMA by gut bacteria
    • Converted to TMAO by liver

• **TMAO**
  • Marker of atherosclerosis in humans
  • Induces atherosclerosis in animals
  • Vegans and Vegetarians make no TMAO when fed L-Carnitine

Plant based basics
Whole food Plant based diet basics

- No Animal products (beef, chicken, fish, eggs)
- No dairy (milk, cheese, yogurt, butter)
- Whole food (minimally processed)
- Complex carbohydrates
  - Avoid sugar
  - Whole grains
- Vegetables
- Legumes
  - RDA Protein 0.8 mg/kg/day
  - No need to calculate
- Fruits
  - Several servings/day
- Fats
  - 10-15% of total calories
Plant based benefits

• Prevent, arrest & reverse heart disease
  • Leading cause of death
  • 80% diet related

• Reverse Type 2 Diabetes
  • 24 million Americans
  • Glucose intolerance—80 million Americans (40% high school)

• Cancer prevention
  • Second leading cause of death
  • 80% diet related

• Improve hypertension
Plant based benefits

• Weight reduction
• Decreased cholesterol
• Erectile dysfunction
• Reduced inflammation
• Reduce osteoporosis
• Cure constipation
• Gastrointestinal reflux
• Diverticular disease
• Kidney disease
• Improved performance
• Environmentally friendly
So you have two choices. We could perform triple bypass surgery, where we take a vein out of your thigh, and open up your chest so we can sew the vein onto your coronary artery. This costs more than $100,000 and will keep you laid up for at least two months.

Or we could put you on a vegan diet.

A vegan diet? Gee, Doc, that sounds pretty extreme.

This meme is based on a quote from Dr. Caldwell Esselstyn.
Myths--calcium
Myths--Milk

• D galactose—causes osteoporosis
• Milk in teen years –9% incidence of hip fractures later in life for each glass/day
• Women increased heart disease, cancer, & death with each glass/day
  • 3 glasses/day doubles mortality over 1 glass/day
• Men increased mortality and 141% increase in prostate cancer with 3 glasses/day
Protein: Horses --100% Plant Based
Protein?
Vegan athletes
Long-term intake of animal flesh and risk of developing hypertension in three prospective cohort studies

Lea Borgi, MD\textsuperscript{a}, Gary C. Curhan, MD, ScD\textsuperscript{a,b}, Walter C. Willett, MD, Dr.P.H\textsuperscript{c}, Frank B. HU, MD, MPH, PhD\textsuperscript{b,c}, Ambika Satija, BA\textsuperscript{c}, and John P. Forman, MD, ScD\textsuperscript{a,b}

\textsuperscript{a}Renal Division, Brigham and Women's Hospital, Boston
\textsuperscript{b}Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston
\textsuperscript{c}Departments of Nutrition and Epidemiology, Harvard School of Public Health

Results—Compared with participants whose consumption was $<$1 serving/month, the pooled hazard ratios (HR) among those whose intake was $\geq$1 serving/day were 1.30 (95% CI: 1.23-1.39) for total meat (a combination of processed and unprocessed red meat), 1.22 (1.12-1.34) for poultry, and 1.05 (0.98-1.13) for seafood. Seafood was associated with an increased risk of hypertension in HPFS and NHS II, but not NHS I. Consumption of any animal flesh $\geq$1 serving/day was associated with an increased hypertension risk (pooled HR=1.30 [1.16-1.47]).

Conclusions—Long-term intake of meat and poultry were associated with increased risk of hypertension. In contrast to our hypothesis, we found a weak but significant trend towards an increased risk of hypertension with increasing seafood consumption.

Conclusions—Long-term intake of meat and poultry were associated with increased risk of hypertension. In contrast to our hypothesis, we found a weak but significant trend towards an increased risk of hypertension with increasing seafood consumption.
Vegetarian diets and incidence of diabetes in the Adventist Health Study-2

<table>
<thead>
<tr>
<th>Diet group</th>
<th>BMI^2</th>
<th>Diabetes^2</th>
<th>Hypertension^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonvegetarian</td>
<td>28.26</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Semivegetarian</td>
<td>27.00</td>
<td>0.72 (0.65, 0.79)</td>
<td>0.77 (0.72, 0.82)</td>
</tr>
<tr>
<td>Pescevegetarian</td>
<td>25.73</td>
<td>0.49 (0.44, 0.55)</td>
<td>0.62 (0.59, 0.66)</td>
</tr>
<tr>
<td>Lactoovo-vegetarian</td>
<td>25.48</td>
<td>0.39 (0.36, 0.42)</td>
<td>0.45 (0.44, 0.47)</td>
</tr>
<tr>
<td>Vegan</td>
<td>23.13</td>
<td>0.22 (0.18, 0.28)</td>
<td>0.25 (0.22, 0.28)</td>
</tr>
</tbody>
</table>

n = 89,224.

KEYWORDS

Abstract: Aim: To evaluate the relationship of diet to incident diabetes among non-Black and

there appeared to be an incremental protection as dietary pattern moved from non-vegetarian to semi-vegetarian to pesco vegetarian to lacto ovo vegetarian to vegan.
Does a Vegetarian Diet Reduce the Occurrence of Diabetes?

Abstract: We studied whether a vegetarian diet reduces the risk of self-reported diabetes among Seventh-day Adventists. At the 1960 follow-up, the risk of self-reported diabetes was approximately 50% lower among Adventists who were lacto-ovo vegetarians compared to non-vegetarians. Within the male Adventist subgroup, the difference was statistically significant. Among female Adventists, the difference was lower but was no longer statistically significant after adjustment for other variables.

**TABLE 6—The Association of Meat Consumption with Diabetes Based on Logistic Regression Analyses**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Meat Consumption</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Reported Diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevalence (1960)</td>
<td>&lt;1 day/wk (vegetarian)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>1+ days/wk (non-vegetarian)</td>
<td>1.7 (1.2, 2.4)</td>
<td>1.4 (1.1, 1.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;1 day/wk</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>1-2 days/wk</td>
<td>1.4 (0.9, 2.3)</td>
<td>1.1 (0.8, 1.6)</td>
</tr>
<tr>
<td></td>
<td>3-5 days/wk</td>
<td>1.5 (0.9, 2.5)</td>
<td>1.2 (0.9, 1.8)</td>
</tr>
<tr>
<td></td>
<td>6+ days/wk</td>
<td>2.7 (1.6, 4.6)</td>
<td>2.3 (1.6, 3.3)</td>
</tr>
</tbody>
</table>

**b**For prevalence data, the regression model included age, percent desirable weight, physical activity (for males only), and frequency of use of meat, eggs, and milk.

**Introduction**

We studied a cross-sectional sample of Seventh-day Adventist and non-Adventist religious groups to assess the association between meat consumption and the occurrence of self-reported diabetes. The analysis was based on a cohort of Seventh-day Adventists who were followed for 40 years. The association between meat consumption and diabetes was strongest among male Adventists and was no longer statistically significant in females after adjustment for other variables.
Taiwanese Vegetarians and Omnivores: Dietary Composition, Prevalence of Diabetes and IFG

Polytomous logistic regression adjusting for age, body mass index, family history of diabetes, education, leisure time physical activity, smoking and alcohol, showed that this vegetarian diet was negatively associated with diabetes and IFG in men (OR for diabetes: 0.49, 95% CI: 0.28–0.89; OR for IFG: 0.66, 95% CI: 0.46–0.95); in pre-menopausal women (OR for diabetes: 0.26, 95% CI: 0.06–1.21; OR for IFG: 0.60, 95% CI: 0.35–1.04); and in menopausal women (OR for diabetes: 0.25, 95% CI: 0.15–0.42; OR for IFG: 0.73, 95% CI: 0.56–0.95).

Abstract

**Introduction:** Vegetarian diets have been shown to improve glucose metabolism and reduce risk for diabetes in Westerners but whether Chinese vegetarian diets have the same benefits is unknown.

**Methods:** We evaluated the association between diet and diabetes/impaired fasting glucose (IFG) among 4384 Taiwanese Buddhist volunteers and identified diabetes/IFG cases from a comprehensive review of medical history and fasting plasma glucose.

**Results:** Vegetarians had higher intakes of carbohydrates, fiber, calcium, magnesium, total and non-heme iron, folate, vitamin A, and lower intakes of saturated fat, cholesterol, and vitamin B12. Besides avoiding meat and fish, vegetarians had higher intakes of soy products, vegetables, whole grains, but similar intakes of dairy and fruits, compared with omnivores. The crude prevalence of diabetes in vegetarian versus omnivore was 8.5% versus 7.3% in premenopausal women, 2.8% versus 2.2% in menopausal women, 0.9% versus 1.0% in men.
Taiwanese Vegetarians and Omnivores: Dietary Composition, Prevalence of Diabetes and IFG

We did not analyze subtypes of vegetarians (vegan, lacto-ovo-, or pesco-), as the AHS-2 did, since most of our vegetarians were of lacto-ovo type, with a small number of vegans ($n = 69$), and there were no cases of diabetes found within the vegan group.

Introduction: Vegetarian diets have been shown to improve glucose metabolism and reduce risk for diabetes in Westerners but whether Chinese vegetarian diets have the same benefits is unknown.

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Egg consumption and the risk of type 2 diabetes mellitus: a case–control study

We found that consumers of \( \geq 5 \) eggs/week had three times greater risk of type 2 diabetes mellitus than those eating \(< 1 \) egg/week.
Calorie Density

The amount of calories in a given weight of food

- “high calorie density” has a lot more calories in a small amount of food
- “low calorie density” has a lot less calories for the same weight of food
- Foods with a low calorie density are more filling, and nutrient dense
Calorie Density

One giant cinnamon bun
480 calories

Multiple servings
of fruit and vegetables
480 calories
800 calories

One cup cashews = 6 baked potatoes
...and why whole plant-based foods will help keep you lean and satisfied.
Why is Plant based nutrition not prescribed regularly?

• Knowledge
  • Only 25% of Medical schools offer a nutrition course
  • USDA—Nutritional guidelines
  • Conflicting studies (often sponsored by industry)

• Attitude
  • The majority of physicians surveyed
    • Did not discuss nutrition because they didn’t want to deprive their patients
    • Did not trust their patients to change eating habits

• Time
• Reimbursement
Facing the Facelessness of Public Health: What’s the Public Got to Do With It?

We have known, but we have not managed to care. At least not care deeply enough to turn what we know into what we routinely do.

Were we to do so, we could eliminate 80% of all heart disease and strokes, 90% of all diabetes, and as much as 60% of all cancer.6

Nor will we, until we face facts. The facts are that public health is faceless, and it is faces—and names—that evoke passion. Because passion is the one-word answer to how do we fix what is most badly broken in public health—the toll of lifestyle-related chronic disease—passion is indeed among our objectives. How do we get there from here?

backyard in Midland, Texas, in 1987.3

And from 1998 to 2005, we were substantially fixated on the drama of Terri Schiavo and her family. Just one family wrestling over irreparable brain injury and the fate of one woman. As surrogate evidence for the power of that drama, type “Terri Schiavo” into Google, and more than 400,000 results are returned.
Questions:

cturissini@partners.org
Eat2cure.org
EAT TO CURE
RESOURCES

WEBSITES
Forks over knives
www.forksoverknives.com
The Engine 2 diet
https://engine2diet.com/
Caldwell Esselstyn, Jr.
www.heartattackproof.com
Physicians Committee for Responsible Medicine
www.pcrm.org
Fat Free Vegan
http://fatfreevegan.com
Happy Herbivore
http://happyherbivore.com
Jeff Novick RD
http://jeffnovick.com
Michael Greger, MD
Nutritionfacts.org
The Plantrician Project
www.plantricianproject.org
Environmental Working Group
Www.ewg.org

BOOKS
Prevent and Reverse Heart Disease
By Caldwell Esselstyn, Jr

Dr. Neal Barnard’s Program for Reversing Diabetes
By Neal Barnard

Food Rules
Omnivore’s Dilemma
By Michael Pollan

Cookbooks
Forks over Knives—The Cookbook
By Del Sroufe

Prevent and Reverse Heart Disease Cookbook
By Ann Crile Esselstyn

Happy Herbivore
By Lindsay Nixon

The Plant Pure Kitchen
By Kim Campbell

DVDS
Forks over Knives
Fast Food (by Jeff Novick)
Engine 2 Kitchen Rescue
Food, Inc

APPS
Fooducate
Forks over Knives
My Fitness Pal
Is it Vegan?
21-Day Vegan Kickstart (pcrm)

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Plant based food pyramid
Use this space to provide more detailed information about your products or services. You can also include a graphic of a product or service.

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur.

Caption describing picture or graphic.

**Main Inside Heading**

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<th>List your product or service here</th>
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</table>

**Price List**

**Business**

Primary Business Address
Your Address Line 2
Your Address Line 3
Your Address Line 4

Phone: 555-555-5555
Fax: 555-555-5555
E-mail: someone@example.com
Why Cover Expensive Medical Treatments That Don’t Work?

Ken Beckman, ASA, ACAS, MAAA, CFA
October 17, 2017
What can Health Care Payers (insurers, self-insured groups, Medicare, Medicaid) do to encourage treatment using Whole Food Plant-Based Nutrition?
Why Whole Food Plant-Based Nutrition is not being used as Medical Treatment

Non Sequitur by Wiley Miller

© Wiley - All Rights Reserved.
November 19, 2014 from www.gocomics.com
http://www.gocomics.com/nonsequitur/2014/11/19
Issue #1 (patients):

Fact that most chronic conditions can be reversed is not widely known
Issue #1 (patients):

Fact that most chronic conditions can be reversed is not widely known

Solution:

• Require patients be advised of plant-based treatment option before non-emergency procedures such as bypass/stents/bariatric surgery

• Deliver a direct message to all insureds:

  “Did you know that diabetes, heart disease, hypertension, obesity, rheumatoid arthritis, erectile dysfunction, etc. can be reversed without drugs and surgery and no negative side effects without counting calories?”
Examples in Practice

• Non-profit health plan/medical group

  Kaiser Permanente journal article: "[p]hysicians should consider recommending a plant-based diet to all their patients, especially those with high blood pressure, diabetes, cardiovascular disease, or obesity."

• Traditional insurer

• Self-insured groups

---


Issue #2 (providers):

• Focus is on managing chronic conditions with medication compliance, procedures and preventative tests that do not address the underlying cause

• Lack of monetary incentives for providers to prevent & reverse chronic disease
Issue #2 (providers):

- Focus is on managing chronic conditions with medication compliance, procedures and preventative tests that do not address the underlying cause

- Lack of monetary incentives for providers to prevent & reverse chronic disease

Solution:

Incentives for physicians/others based on value patients receive (their health)
What about Current Value Based Initiatives?

Healthcare Effectiveness Data and Information Set (HEDIS) – used by 90% of health plans to “measure performance on important dimensions of care and service”

CMS uses HEDIS to improve “care quality” and assist in “making patients healthier”

<table>
<thead>
<tr>
<th>Examples of HEDIS measures</th>
<th>Normal Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controlling High Blood Pressure:</strong></td>
<td></td>
</tr>
<tr>
<td>% of Hypertensive patients with BP &lt; 140/90</td>
<td>&lt; 120/80</td>
</tr>
<tr>
<td><strong>Comprehensive Diabetes Care, HbA1c Poor Control:</strong></td>
<td></td>
</tr>
<tr>
<td>% of Diabetics with A1c&gt;9% or failed to have A1c recorded</td>
<td>&lt;7%</td>
</tr>
</tbody>
</table>

These measures do not provide incentives to achieve optimal patient health.


How to Measure Patient Value = Improvement in Health

(1) Use Change in Objective Clinical Measures
   - BMI
   - Cholesterol
   - BP
   - A1c
   - CRP
   - Endothelial function
   - TMAO

(2) Relate Measures to Claim Costs
   (e.g. 1% change in A1c = $1000 of claim cost)
### Actuarial Patient Value Model:
Financial Incentives Based on Improvement in Patient Health

<table>
<thead>
<tr>
<th>Diabetic Patient with HbA1c of:</th>
<th>Treatment Year</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5+</td>
</tr>
<tr>
<td>9.0</td>
<td>$15,000</td>
<td>$7,500</td>
<td>$7,500</td>
<td>$7,500</td>
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<tr>
<td>6.5</td>
<td>$1,500</td>
<td>$750</td>
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<td>Expected Total Health Spending:</td>
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<td>$2,000</td>
</tr>
<tr>
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<td>$5,500</td>
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<td>$5,500</td>
</tr>
<tr>
<td>PCP Share of Health Spending:</td>
<td>$1,500</td>
<td>$750</td>
<td>$750</td>
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<td>$750</td>
</tr>
<tr>
<td>Incentive Payment to PCP:</td>
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<td>$2,000</td>
<td>$2,000</td>
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<td>$2,000</td>
</tr>
<tr>
<td>Net Savings Relative to Year 1:</td>
<td>$5,500</td>
<td>$5,500</td>
<td>$5,500</td>
<td>$5,500</td>
<td>$5,500</td>
</tr>
</tbody>
</table>
Ways for Providers to Educate Patients

• Integral part of entire primary care practice
  - Barnard Medical Center
  - Ethos Health

• Single Site Seminars
  - Cleveland Clinic Wellness Institute (Dr. Caldwell Esselstyn)
  - Montefiore Health System (Dr. Robert Ostfeld)

• Multi-Site Centers
  - Complete Health Improvement Program (CHIP)

• Online
Why Do Actuaries Need to Get Involved?

• Bring an unbiased perspective
• Experts in developing sustainable financial security systems
• Key role with payers; payers can facilitate large scale implementation
Nathan Pritikin:

“All I’m trying to do is wipe out heart disease, diabetes, hypertension, and obesity.”