Local Cultures, Local Biologies: Biocultural Approaches to the Study of Human Health

Melissa K. Melby
Social Sciences & Human Heath Initiative
University of Delaware
9 November 2011
Bridge between Social Sciences and Human Health

Social determinants

Biological determinants

Your Photo Here
Plant-Insect Communication/Coevolution → Chemistry

Arum lily (thermogenesis)

Leaf cutter ants (chemical communication)

Xylose isomerase

Biodegradable Plastic
Medicinal Plants & Ethnobotany ➔ Anthropology

People and Plants Initiative

(TWWF, UNESCO, and Kew Gardens)
I. Biology & Culture of Menopause in Japan

- Lock’s findings of:
  - No single word for hot flushes
  - Low rates of hot flushes and night sweats

- Biology & Ecology:
  - Soy Phytoestrogens
Natural Experiments

Koriyama
Tohoku (N=77)
22.4% Higher

Kinki (N=68)
12.3% Lower

Regional Soy Consumption
Relative to National Average

Japanese Ministry of Health 1996
Biocultural Lessons from Study of Menopause in Japan

1. Women’s language may highlight interesting biology

2. You are NOT only what you eat

3. Thermoregulation across a continuum may be important to menopause and influenced by diet
Kōnenki Status (emic) Vs. Menopausal Status (etic)

Don't know
Post
End
Mid
Beg
Pre

Pre (34)
Peri (63)
Post (24)

Menopausal Status

(N=121)

Melby 2005 Menopause
Hot Flush by Menopausal & Kōnenki Status

Both are based on self-report. But which captures relevant biological variation better?

Odd to see pre-menopausal women with symptoms

Melby 2005 Menopause
## Hot Flush Prevalence: 2-Week Recall

<table>
<thead>
<tr>
<th>Hot flushes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot flush (hoteru)</td>
<td>17.1</td>
</tr>
<tr>
<td>Hot flush (kyu na nekkan)</td>
<td>10.7</td>
</tr>
<tr>
<td>Hot flush (nobose)</td>
<td>9.3</td>
</tr>
<tr>
<td>Hot flash (hotto furasshu)</td>
<td>3.0</td>
</tr>
<tr>
<td>Any Hot flush</td>
<td>22.1</td>
</tr>
</tbody>
</table>

If only ask 1 symptom (as many checklists do), may underestimate symptom prevalence

7-Fold Difference!

Melby 2005 Menopause
Hot Flush Terminology

Precision: How did they define them?

Response frequency (%)

Symptom Terminology

Melby, 2005
Menopause
2. You are NOT only what you eat

- ‘Bugs’ that inhabit your gut may ‘process’ your food
Phytoestrogens: Estrogen-like Plant Compounds

- Epidemiological observations:

<table>
<thead>
<tr>
<th></th>
<th>Asia</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoflavone Intake</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Menopausal Symptoms</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

- Soy isoflavones have potential benefit for menopausal symptoms and reproductive cancers

- But soy intervention studies in the West have conflicting results
Regional Variation in Soy Product Intake (by Dietary Records)
Finger-Prick Dried Blood Spot Method

Finger-prick, as used regularly by diabetics

Filter paper used for newborn metabolic screening
Chemical Structures of Estradiol, Genistein, Daidzein, and Equol

17beta-Estradiol

Daidzein

Genistein

Equol

Metabolite found in 50-60% of Japanese women, but only 10-20% of US women
PE Concentrations by Region

Kyoto Fukushima

Region

D and Eq significantly higher (p = 0.02 and 0.004) in Fukushima (Mann-Whitney nonparametric test) Measured by HPLC-CEAD

Melby et al. 2005 J Chrom

Median IF concentration Roughly 1µM
3. Thermoregulation (both ends of the spectrum – sweating and shivering) may be important to menopause and influenced by diet
   Chilliness (29% prevalence)
Vasomotor Symptoms, Thermoregulation & Soy: Thermoneutral Zone

Rectal $T_c$ (°C)

| 37.7 | 37.3 |

Symptoms

- U.S. women: None, HF, SW
- Japanese: None

Sweating threshold

Thermoneutral zone

Shivering threshold

R. Freedman
Vasomotor Symptoms, Thermoregulation & Soy: Thermoneutral Zone

Rectal $T_c (\degree C)$

37.7

US women

None

Hot Flushes

With E2

Hot Flushes Alleviated

37.3

Japanese women

EqP

None

EqNP

Chilliness

Shivering threshold

Thermoneutral zone

Sweating threshold

Melby 2007 Menopause
Biocultural Lessons from Study of Menopause in Japan

- Talking to people may lead to discoveries of novel biology related to health.

- Local biology: cultural and local environment influence local biology and health

- Studying population diversity in symptoms & experience → discoveries of novel symptoms → elucidate underlying physiological mechanisms and interactions between health and environment
II. Developmental Origins of Childhood Obesity in Japan

Barker Hypothesis: Death from heart disease decreases as birth weight increases.
Also true for weight at age 1.

Sept 2010
Dieting of Japanese women→ another natural experiment

- About ¼ of Japanese women have BMI<18.5
  (normal BMI:18.5-24.9)
- Many pregnant women try not to gain much weight
- % of LBW babies (<2.5kg or 5lbs, 8 oz) has increased from 5→ 10% in 1 generation

Unlike most developed nations, where new moms are getting fatter, in Japan they’re becoming thinner.
Environmental Mismatch Theory
Developmental Origins of Child Obesity & Metabolic Syndrome
Prevent ‘metabo’ campaign

Maximum or minimum waistlines?
III. Cultural Consensus Analysis
Relating to Dietary Behaviors

Problems
Causes
Solutions
# Intracultural Models of Breast Cancer Risk

<table>
<thead>
<tr>
<th>Group</th>
<th>Salvadoran</th>
<th>Mexican</th>
<th>Chicana</th>
<th>Anglo</th>
<th>Dr</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>28</td>
<td>39</td>
<td>27</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>#1 reason</td>
<td>Blows, bruises</td>
<td>Blows, bruises</td>
<td>Food chemicals</td>
<td>Family history</td>
<td>Family history</td>
</tr>
<tr>
<td>#2 reason</td>
<td>Milk pdtn problems</td>
<td>Never breastfeeding</td>
<td>Environmental pollution</td>
<td>Radiation</td>
<td>Obesity</td>
</tr>
</tbody>
</table>
Skipping Breakfast
Cultural Domains of Dietary Lifestyle

Problems  Causes  Solutions

Gap

Professionals (Nutritionists)

Lay Public
Acknowledgments: Funding

Menopause Research
- U.S. NSF and NIH; Wenner-Gren Foundation for Anthropological Research; Woodrow-Wilson Johnson & Johnson Fund for Women’s Health; Japanese Ministries of Health, Labor and Welfare & Education, Sport and Culture; Fuji Foundation for Promotion of Protein Research; Mary Ellen A. Sarbaugh Grant for Research on Women’s Health; Emory University Graduate School of Arts and Sciences & Department of Anthropology

Developmental Origins of Childhood Obesity
- Wenner-Gren Foundation for Anthropological Research; Japan NIHN Shokuiku Project Intramural Funds

Dietary Cultural Domains
- Japan NIHN Shokuiku Project Intramural Funds & Abe Fellowship (Social Science Research Council)
Q & A - Solutions for my AADD: Find More Collaborators

AADD (academic attention deficit disorder)

Solutions
Finally, a science-based, natural approach without dangerous, addictive drugs

What Causes ADD & ADHD?
1) Brain starvation for nutrients
2) Brain poisoning with toxins
3) Psychological stress
4) Genetic vulnerability
5) All of the above

Increase the People/Projects Ratio

Please Help!

Contact me: mmelby@udel.edu

Charles Gant, MD, PhD, NMD
Other Research Topics of Interest

- Links between environment (physical and sociocultural) and human health
  - physiology (intestinal microflora and phytochemicals or xenoestrogens)
  - structural (societal and global) constraints on lifestyle → health disparities
  - Sustainability (agriculture, food security, climate change)

- Population variation in developmental trajectories
  - Biocultural determinants of breastfeeding and attachment
  - Biocultural basis of sensory integration & autonomic nervous system development
  - Mental health/depression across lifespan