Nutrition Risk Reduction during Disaster

Philippine International Convention Center, Manila, Philippines 26 August 2015

Japan Experience:
Proposal of “Disaster-Nutrition” as A Novel Nomenclature

Teruyoshi Amagai, MD, PhD
Mukogawa Women’s University
amagait@nutrped.com
Conflict of Interest

Nothing to declare
## COMPARISON OF MAJOR MEGA-EARTHQUAKE in JAPAN during the last 100 YEARS

<table>
<thead>
<tr>
<th>Disaster Name</th>
<th>Kanto Mega Disaster</th>
<th>The Southern Hyogo prefecture earthquake (so called Hanshin-Awaji earthquake)</th>
<th>GEJED (Great East Japan Earthquake Disaster)</th>
</tr>
</thead>
<tbody>
<tr>
<td>year</td>
<td>1923</td>
<td>1995</td>
<td>2011</td>
</tr>
<tr>
<td>month</td>
<td>Sep</td>
<td>Jan</td>
<td>Mar</td>
</tr>
<tr>
<td>day</td>
<td>1</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>time</td>
<td>11:58</td>
<td>5:46</td>
<td>14:46</td>
</tr>
<tr>
<td>magnitude *</td>
<td>7.9</td>
<td>7.3</td>
<td>9.0</td>
</tr>
<tr>
<td>relative energy ratio **</td>
<td>4</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Victims, n</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dead</td>
<td>105, 000***</td>
<td>6,434</td>
<td>15,884</td>
</tr>
<tr>
<td>missing</td>
<td>na</td>
<td>3</td>
<td>2,633</td>
</tr>
<tr>
<td>injured</td>
<td>na</td>
<td>43,792</td>
<td>6,148 (as of Mar 10, 2014)</td>
</tr>
<tr>
<td>Main cause of death</td>
<td>Burn and crashed</td>
<td>Compressed by furnitures</td>
<td>Drowning by Tsunami</td>
</tr>
<tr>
<td>Direct cause of death</td>
<td>Earthquake</td>
<td>Earthquake</td>
<td>Mega Earthquake, Tsunami, and Nuclear accident</td>
</tr>
</tbody>
</table>

The 3 Concomitant Disasters in GEJED

GEJED (Great East Japan Earthquake Disaster)
### Definition of DRD: Indirect death of the disaster

#### Disaster-Related Deaths (DRD) As Consequences of the GEJED

<table>
<thead>
<tr>
<th>Prefecture</th>
<th>Geographic Location in GEJED</th>
<th>Death (A)</th>
<th>Missing (B)</th>
<th>DRD (C)</th>
<th>DRD / All DRDs</th>
<th>Total (A+B+C) (D)</th>
<th>DRD Ratio (C/D, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Iwate</td>
<td>northeast</td>
<td>4673</td>
<td>1142</td>
<td>417</td>
<td>14.3%</td>
<td>6232</td>
<td>6.7%</td>
</tr>
<tr>
<td>2 Miyagi</td>
<td>middle</td>
<td>9537</td>
<td>1280</td>
<td>873</td>
<td>30.1%</td>
<td>11690</td>
<td>7.5%</td>
</tr>
<tr>
<td>3 Fukushima</td>
<td>southern</td>
<td>1607</td>
<td>207</td>
<td>1572</td>
<td>54.2%</td>
<td>3386</td>
<td>46.4%</td>
</tr>
<tr>
<td>4 Ibaraki</td>
<td>southeast</td>
<td>24</td>
<td>1</td>
<td>41</td>
<td>1.4%</td>
<td>66</td>
<td>62.1%</td>
</tr>
</tbody>
</table>

The Map around Fukushima Nuclear Plant I and Fukushima-Rosai Hospital

30 km distance from the Nuclear Plant

- Fukushima Nuclear Power Plant - I
- Fukushima Nuclear Power Plant - II
- Fukushima Rosai Hospital
History of Philippines’ Nuclear Plant

Start to Build
1976 Bataan Nuclear Plant

1979 Three-mile Island Nuclear Accident

1983 Eruption of Pinatubo Volcano

1983 Chernobyl Nuclear Accident (Level 7)

Decided to stop Bataan Nuclear Plant
### Number and % of DRD* according to Age in the 4 Prefectures affected GEJED

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Iwate</th>
<th>Miyagi</th>
<th>Fukushima</th>
<th>Ibaraki</th>
<th>Whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 20 yo</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>21-65 yo</td>
<td>52</td>
<td>110</td>
<td>141</td>
<td>6</td>
<td>309</td>
</tr>
<tr>
<td>≥ 66 yo</td>
<td>364</td>
<td>762</td>
<td>1431</td>
<td>33</td>
<td>2590</td>
</tr>
<tr>
<td>Total</td>
<td>417</td>
<td>873</td>
<td>1572</td>
<td>41</td>
<td>2903</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Iwate</th>
<th>Miyagi</th>
<th>Fukushima</th>
<th>Ibaraki</th>
<th>Whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0.1% 10.6% 89.2% 100%

*DRD= Disaster-Related Deaths

VICTIMS OF DISASTER-RELATED DEATHS
As Consequence of the DEJED

1. The Older Adults

2. Disabled (Handicapped) Persons

3. Small Children

Frailty – Phenotype

1. Weight ↓
2. Exhaustion
3. Activity ↓
4. Gait speed ↓
5. Grasp power ↓

Frailty:
- 3: Frailty
- 1,2: Pre-frailty
- 0: Non-frailty

Functional Impairments As Causes of Frailty

Physical: Muscle (gait, grasp, swallow), Heart, Lung

Psychological: Cognitive, Emotional

Social

L. Reid, 2000
The 3 Concomitant Disasters and Frailty in GEJED

- Social isolation
- Fear
- Immobilization
- Polypharmacy
- Shelter diet

Nuclear Accident

- Sadness
- Depression
- Shelter diet

GEJED (Great East Japan Earthquake Disaster)
## Chronology of Medical Issues, Public Services & Nutrition Issues after the GEJED

### Healthcare Issues<sup>1</sup>

<table>
<thead>
<tr>
<th>Days after the Disaster&lt;sup&gt;1&lt;/sup&gt;</th>
<th>&lt; 24 hours</th>
<th>2-10 days</th>
<th>10-30 days</th>
<th>&gt; 30 days</th>
<th>throughout</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 24 hours</td>
<td>Hypothermia, endogenous disease, burning, Tsunami-lung, psychiatric shock, CPA, coronary syndrome, CVD, drug-refugees</td>
<td>Respiratory disease, gastritis, pressure ulcer, exacerbation of chronic conditions, allergic reactions to tsunami debris</td>
<td>Children with allergy, musculoskeletal disease, DVT, pulmonary embolism</td>
<td>NCD, Hypertension, DM, CRF, cancer etc, pregnancy hypertension, oxygen-dependent management, insomnia, skin-related disorders</td>
<td></td>
</tr>
</tbody>
</table>

### Stage for Disaster Provisions*<sup>2</sup>

<table>
<thead>
<tr>
<th>Weeks after the GEJED by authors’ opinion</th>
<th>1st</th>
<th>1st</th>
<th>2nd</th>
<th>2nd</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage for Disaster Provisions*&lt;sup&gt;2&lt;/sup&gt;</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

### Utilities<sup>4</sup>

<table>
<thead>
<tr>
<th>Water Services</th>
<th>Electricity Services</th>
<th>Gas Services (city, propane)</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

### Disaster Provisions<sup>4</sup>

<table>
<thead>
<tr>
<th>Food provisions to warm in the hot water:</th>
<th>✗</th>
<th>✗</th>
<th>✗</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. oatmeal (OKAYU), rice ball, rice, stew</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

### Food provisions:

- Cracker, hardtack, bread, canned food, nutritional supplements
- Crackers, hardtack, bread, canned food, nutritional supplements
- Food provisions adding hot water: e.g. oatmeal (OKAYU), rice ball, rice, stew
- Food provisions to warm in the hot water: e.g. retort provisions such as curry, rice, beef bowl (GYU-DON) etc
- Anything (not particular)
### Nutritional Facts of Shelter Diet

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Protein</th>
<th>Vit B 1</th>
<th>Vit B 2</th>
<th>Vit C</th>
<th>Retinol</th>
<th>Vit E</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary intake recommended (A)</td>
<td>2,000 kcal</td>
<td>55 g</td>
<td>1.1 mg</td>
<td>1.2 mg</td>
<td>100 mg</td>
<td>800 ug</td>
<td>6.75 mg</td>
<td>3,268 mg</td>
<td>2,250 mg</td>
<td>675 mg</td>
<td>7.5 mg</td>
</tr>
</tbody>
</table>

**Three-days’ Average (Apr 29, 2011-May 1, 2014)**

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Protein</th>
<th>Vit B 1</th>
<th>Vit B 2</th>
<th>Vit C</th>
<th>Retinol</th>
<th>Vit E</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average provided amount (B)</td>
<td>2,118 kcal</td>
<td>67 g</td>
<td>1.2 mg</td>
<td>1.4 mg</td>
<td>42.2 mg</td>
<td>619.8 ug</td>
<td>8.0 mg</td>
<td>4,645 mg</td>
<td>2,844 mg</td>
<td>709.7 mg</td>
<td>6.8 mg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Protein</th>
<th>Vit B 1</th>
<th>Vit B 2</th>
<th>Vit C</th>
<th>Retinol</th>
<th>Vit E</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficiency rate (B/A, %)</td>
<td>106%</td>
<td>121.8%</td>
<td>109.1%</td>
<td>116.7%</td>
<td>42.2%</td>
<td>87.3%</td>
<td>118.5%</td>
<td>197.4%</td>
<td>128.2%</td>
<td>105.1%</td>
<td>90.7%</td>
</tr>
</tbody>
</table>

**June 17, 2011**

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Protein</th>
<th>Vit B 1</th>
<th>Vit B 2</th>
<th>Vit C</th>
<th>Retinol</th>
<th>Vit E</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average provided amount (C)</td>
<td>1,835 kcal</td>
<td>58 g</td>
<td>0.9 mg</td>
<td>1.1 mg</td>
<td>72 mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Protein</th>
<th>Vit B 1</th>
<th>Vit B 2</th>
<th>Vit C</th>
<th>Retinol</th>
<th>Vit E</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficiency rate (C/A, %)</td>
<td>91.8%</td>
<td>105.5%</td>
<td>81.8%</td>
<td>91.7%</td>
<td>72.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Double Salt Intake**
- Hypertension
- Stroke
- Myocardial Infarction

**Disaster-Related Death (DRD)**

The 3 Concomitant Disasters and Frailty in GEJED

1. **Nuclear Accident**
2. **Earthquake**
3. **Tsunami**

GEJED (Great East Japan Earthquake Disaster)
Reversibility of Frailty

Time Courses in patients with and without Frailty


Minor illness (e.g. Urinary Tract Infection)

Healthy

Frailty

1, Deeper

2, Longer

3, Lower

Days
Proposal of Policy “Bicycle-Model”
To Prevent The Frailty

Around The Shelter

1. Exercise
2. Nutrition

Non-frailty → Frailty → disability → death
“Human-Contact Model” between small children and the older adults in the Super-Aging Society (Shelters)

**Model 1 - Linear Model**
(Age Scale)

- Society (Shelter)
- Exercise Lesson, School, Lunch

- Age
  - 0
  - 15
  - 65

**Model 2 - Circle Model**
(Age Clock)

- Small Children
- Older Adults

- Age
  - 0
  - 15
  - 65

- Society (Shelter)
To Answer the Question
Whether “Evidence-based Policy” make a difference

Evidence-based Policy (Ev-BP)

Experience-based Policy (Ex-BP)

Compare Outcomes:
Morbidity and Mortality
Incidence of frailty using “before and after study”
1. Rapid Pace: Uncomfortable for Academics

2. Unavoidable tension between sufficient information versus the need to act now

3. Different weights between experience versus evidence

4. Unquestionable appeal of policy-making based on anecdotes
Take-Home Message

“Disaster-Nutrition”

1. “Disaster-Nutrition” As A Novel Nomenclature


3. Evidence-based Policy vs. Experience-based Policy