Defeating Diabetes...
A story of hope from the Marshall Islands

Brenda Davis, RD
Where are the Marshall Islands?
Stats

- Number of islands: 1200
- Total land area: 70 square miles
- MI Population: 60,000
- Majuro area: 3.7 square miles
- Majuro Population: 30,000
Marshall Islands: State of Emergency

- The Marshallese have the highest death rates from diabetes in the world.

- Estimated prevalence
  - T2 diabetes
    - 50% - 35 years or more
  - Prediabetes or T2D
    - 90-95% - adults

- About half of all surgeries on the islands are amputations due to diabetes.
Was Diabetes a Problem in the Past?

• 70 years ago, diabetes was practically unheard of in the Marshall Islands.

• People were slim, physically active and they lived off the land.
What was the traditional diet?

- Coconut
- Pelee Leaves
- Fish and seafood
- Breadfruit
- Bananas
- Pandanas
What happened?
Lifestyles Changed
Diets Changed
Top Sources of Calories in the Marshallese Diet

- White rice
- White bread and rolls
- Donuts and white flour baked goods
- Spam and other canned meat
- Chicken
- Ramen noodles
- Sweetened beverages
- Fish
- Other meat
- Salty snacks
For most Marshallese, 95% of calories come from processed foods and animal products!
Diabetes by Design
The Diabetes Wellness Project
March 2006

• **Founder** – Canvasback Missions Inc. (SDA Medical Mission Group)
• **Funding** – Grant awarded by the US Department of Defence.
• **Partners** – Marshall Islands MOH and Loma Linda University.
The Research...

Aggressive Lifestyle Intervention vs Usual Care

• 169 Majuro residents with HbA1c ≥ 8 or taking diabetes medications

• Assigned to an intervention group or a control group using a randomized parallel design with 5 overlapping cohorts for 24 weeks.
The Goal…
To reverse the diabetes epidemic!

- **Step 1** – Prove that type 2 diabetes can be successfully treated with diet and lifestyle intervention in the Marshall Islands.
- **Step 2** – Adoption of the program as standard treatment for all Marshallese.
<table>
<thead>
<tr>
<th>Week</th>
<th>Frequency</th>
<th>Program Time Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 4, 6</td>
<td>4 Weekdays</td>
<td>Noon session – 1 hour Evening session – 5 hours</td>
</tr>
<tr>
<td>3, 5, 7, 8</td>
<td>Twice weekly</td>
<td>Evening session – 5 hours</td>
</tr>
<tr>
<td>9-12</td>
<td>Weekly</td>
<td>Evening session – 5 hours</td>
</tr>
<tr>
<td>13-24</td>
<td>Monitoring only</td>
<td>Turn in glucometer and pedometer readings. Lab tests.</td>
</tr>
</tbody>
</table>
## Intensive Phase Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 – 7:30 am</td>
<td>Walk</td>
</tr>
<tr>
<td>7:30 – 7:45 am</td>
<td>Fasting BG</td>
</tr>
<tr>
<td>7:45 – 8:45 am</td>
<td>Breakfast</td>
</tr>
<tr>
<td>12:00 - 1:00</td>
<td>Lunch at clinic</td>
</tr>
<tr>
<td>3:00 – 3:15 pm</td>
<td>Pre-exercise BG</td>
</tr>
<tr>
<td>3:15 – 4:15 pm</td>
<td>Exercise class</td>
</tr>
<tr>
<td>4:15 – 4:30 pm</td>
<td>Post-exercise BG</td>
</tr>
<tr>
<td>4:30 – 6:00 pm</td>
<td>Cooking class</td>
</tr>
<tr>
<td>6:00 – 6:30 pm</td>
<td>Dinner</td>
</tr>
<tr>
<td>6:30 – 7:00 pm</td>
<td>Walk</td>
</tr>
<tr>
<td>7:00 – 8:00 pm</td>
<td>Lecture</td>
</tr>
<tr>
<td>8:00 – 8:15 pm</td>
<td>Evening BG</td>
</tr>
</tbody>
</table>
Primary Diet Objective

• To restore insulin sensitivity:
  ✓ Produce weight loss in overweight participants
  ✓ Improve blood glucose control
  ✓ Reduce oxidation and inflammation
  ✓ Restore nutritional health.
Conquering a Metabolic Monster

- Chronic Inflammation
- Oxidative Stress
- Endothelial Dysfunction
- Overweight/Obesity
- Elevated Blood Glucose
- Overeating
- Lack of Sleep
- Unhealthy Gut Flora/Leaky Gut
- Hormonal Imbalances
- Nutritional Excesses and Deficiencies
- Insulin Resistance
- Pre-diabetes
- Diabetes

Roles:
- Conquering a Metabolic Monster
- Chronic Inflammation
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- Pre-diabetes
- Diabetes
Diet Design
1. Whole Foods, Plant-based Diet
Return to Local Foods?

• While a return to a local foods makes sense from a health perspective, it is not possible from a practical perspective because there are more people than the island can sustain.
The Solution?
Local Foods + Healthy Imported Foods

• Subsidize healthy foods so they are affordable and accessible.

• Good choices are legumes, barley and low cost vegetables such as cabbage and squash.
2. Negative Energy Balance

Caloric deficit to produce weight loss in obese and overweight individuals.

- Decrease energy input
  - Emphasis on low caloric density foods
  - Minimal liquid calories
  - Portion control

- Increase energy output:
  - Exercise classes
  - Walking after meals

Overweight and obesity rates:
- 75% - women
- 50%+ - men
3. High Nutrient Density

- Nutrient density is maximized so that nutritional status is restored, even in the face of a caloric deficit.
- Ensure that every calorie contributes to healing rather than disease.
Emphasis on carbohydrates from whole plant foods.
5. Low Glycemic Load (GL)

Focus on foods that don’t cause a rapid rise in blood sugar.
Strategies

• Emphasize non-starchy vegetables and beans.
• Control servings sizes of starchy vegetables and whole grains – blood glucose targets could not be reached with unlimited servings in this population.
• Carefully select grains:
  – Use mainly intact whole grains.
  – Minimize use of refined grains, especially ground and puffed grains.
  – Emphasize low GI grains, e.g. barley (GI = 28).
Whole Grain Hierarchy

Intact whole grains
- e.g. wheat berries, brown rice, barley, oat groats, quinoa

Broken whole grains
- e.g. Red River cereal, 12 grain cereal

Rolled whole grains
- e.g. rolled oats, barley, rye

Shredded whole grains
- e.g. shredded wheat

Ground whole grains
- e.g. whole wheat flour products

Flaked whole grains
- e.g. cold flaked cereals

Puffed whole grains
- e.g. puffed wheat, rice, millet
6. High Fiber

35+ grams per day.
Current diet provides 5-10 grams per day.
Aim for at least 10 grams of fiber per meal. Focus on viscous fiber (legumes, barley, oats, flax).
7. Moderate total fat; focus on healthy fat.

- Total fat 20-25% of calories – mainly from whole foods such as nuts, seeds and coconut.
- Low saturated fat; no trans fats.
- Sufficient omega-3s.
- Minimal oil.

Traditional Diets

- Relatively high fat, with about 50-60% of calories from coconut (young coconut meat, coconut water, mature coconut, coconut sprout, coconut milk, etc.) and 20-30% from fish.
8. Anti-inflammatory – High Phytochemicals & Antioxidants

- Antioxidant status is compromised with poorly controlled blood glucose, accelerating complications.

- To improve antioxidant status, colorful plant foods are strongly emphasized, including superstars such as cruciferous vegetables, sprouts, herbs and spices.
9. Low Dietary Oxidants

- **Agrochemicals**
  - Pesticides, plant growth regulators, veterinary drugs (e.g. hormones, antibiotics, antimicrobial agents)

- **Environmental Contaminants**
  - Heavy metals
  - POPs (e.g. PCB’s, DDT, dioxins)
  - Packaging materials (e.g. tin, lead, PBA)

- **Products of Food Processing and High Temperature Cooking**
  - Heterocyclic amines
  - Polycyclic aromatic hydrocarbons
  - Acrylamide
  - AGE’s

- **Food additives**
  - Preservatives
  - Artificial colors and flavors
  - Artificial sweeteners
10. Moderate Sodium

Recommended: <2300 mg/day
What Did Participants Eat?
Breakfast
Dinner
Other Program Details
Daily Walking
Cardio Dance and Strength Classes
Cooking Classes
Shopping Tours
The Affordable Produce Challenge

- Imported produce is expensive.
Teach people to garden.
Education Sessions

- Lifestyle and chronic disease
- Food and nutrition
- Exercise
- Stress management
- Dental health
- Care of eyes and feet
- Medical management, medications, etc.
- Agriculture
Two-Week Transformation

- First 2 weeks, participants report:
  - Pain in joints, arms and legs is reduced or eliminated.
  - Able to sleep through the night.
  - Increased energy.
  - No longer constipated.
  - Think more clearly.
<table>
<thead>
<tr>
<th>Measure</th>
<th>Change at 2 weeks</th>
<th>Change at 12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBS (mg/dL)</td>
<td>-71</td>
<td>-48</td>
</tr>
<tr>
<td>HbA1C</td>
<td>-0.7</td>
<td>-2.0</td>
</tr>
<tr>
<td>HOMA-IR</td>
<td>-2.7</td>
<td>-2.3</td>
</tr>
<tr>
<td>BMI</td>
<td>-0.7</td>
<td>-0.2</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>-7</td>
<td>-7</td>
</tr>
<tr>
<td>Total Chol</td>
<td>-20</td>
<td>-13</td>
</tr>
<tr>
<td>hsCRP</td>
<td>-1.2</td>
<td>-1.2</td>
</tr>
</tbody>
</table>
Factors Adversely Affecting Results

- About 1/3 of participants were fully committed; 1/3 partially committed; 1/3 fell back into usual patterns.
- Those who went back to former eating patterns often failed to resume taking medications.
- It was impossible to have a true “control group”.

Committed Participants

- The participants who stuck with the program enjoyed the greatest success, many eliminating need for medications and achieving normal blood glucose levels.
Participants in the Diabetes Wellness Program are providing hope amid a deep sense of hopelessness. They have:

- Overcome seemingly insurmountable mountains of Spam, donuts, ramen and cola.
- Put together low cost, healthful meals despite the high cost and poor quality of their produce, and the lack of resources.
- Managed with little education and marginal English skills.
- Succeeded with few gyms, no trails and a cultural taboo against women wearing pants.
The Challenge

• The best education program in the world is not enough.
• Marshallese culture is group oriented. Everything is shared, including food.
• Community ownership is the key to long-term success for individuals.
• Changes must be embraced by the government, church groups, community groups, schools, restaurants, etc.
Current Efforts

• Research grant has run out.
• Focus has shifted away from research to community action.

I choose smart foods.
Research Published?
Vital Partnerships: Ministry of Health and RMI government
Restaurants and Grocery Stores
Community groups, church leaders, police, fire dept. etc.
Reaching Youth
Free Exercise Classes
Hospital Gardens
Battling our health crisis

Nitijela officials, including Education Minister Nidel Lorak (left) and Clerk Joe Riklon, are getting an intensive two-week training in the two "Es" — eating and exercise — from the Ministry of Health/ Diabetes Wellness Program. It's part of the effort to promote World Diabetes Day and to give leaders the opportunity to experience first-hand how the Diabetes Wellness Center has been promoting healthy lifestyle for Marshallese to reverse the diabetes crisis in the RMI.

Free Lifestyle Interventions
January/February 2014
Ebeye and Majuro

Ebeye
- Area – 0.14 sq miles
- Population – 15,000
Foods You Want

1. SALAD
2. COCONUT
3. GREEN CURRY
4. NOODLES
5. GARLIC
6. SPICY BEAN SOUP
7. BEANS
8. TOFU
9. MUK VEGGIE
10. SEED MILK
11. OATMEAL
12. NUTS
13. LENTILS
14. PEA
15. BEAN
16. GARLIC
17. BANANA
18. BAYLE
19. FRUIT
20. NUTRITIONAL YEAST/ALMOND
21. FISH/BEEF
22. PRAWN
23. SHRIMP
24. TOFU
Results

• Majuro Intervention
  ▪ Average fasting glucose drop: 119 mg/dl
  ▪ Average after exercise glucose drop: 68 mg/dl

• Ebeye Intervention
  ▪ Average fasting glucose drop: 50 mg/dl
  ▪ Average after exercise glucose drop: 116 mg/dl
Could this type of program work at home?
If there is hope in the Marshall Islands, given the enormous barriers they face, there is hope at home.
The hope rests on demand from those affected, and the integration of lifestyle medicine into our health care system. It must be offered as a treatment option!
Meet Carlos

• **Medical History**
  - Type II diabetes (diagnosis 1993)
  - Coronary Heart Disease – one serious MI
  - High blood pressure
  - High cholesterol
  - Peripheral artery disease
  - Early stage renal failure

• **Treatment**
  - 17 pills/day
  - Insulin 40 units per day
After almost 3 years on a whole-foods, high raw, vegan diet:

- Carlos takes ZERO insulin and ZERO pills.
  - His **FASTING GLUCOSE** is 80-87 mg/dl.
  - His **A1C** is 4.9.
  - His **BLOOD PRESSURE** is 115/70.
  - His arteries have opened up, without surgical intervention. The scar tissue resulting from his heart attack has shrunk.
  - There are no signs of peripheral artery disease.
  - His kidney function is perfectly normal.
The science is complicated.
The solution is simple.
• Medications and surgeries cannot prevent or reverse lifestyle-induced diseases because they do not address the root cause of the diseases.
• Only profound lifestyle changes can prevent or reverse lifestyle-induced diseases.
A Call To Action

It is time for governments to develop policies that make healthy choices easy for people.

It is time health-care systems offer treatment programs that reflect our current state or knowledge, and food services that support health rather than undermine it.
Komol Tata — Thank you!
Faculty/Presenter Disclosure

- **Faculty**: Brenda Davis, RD

- **Relationships with commercial interests**:
  - Consulting Fees: Goodman Group; Canvasback Missions

- **Potential conflict(s) of interest**: None.
Learning Objectives

1. Explain why the Marshallese have among the highest rates of diabetes in the world.

2. State at least 5 factors that can impact insulin resistance.

3. List at least 3 dietary modifications that will reduce the glycemic load of a plant-based diet.

4. Describe at least 4 features of dietary patterns most strongly liked to diabetes risk.