Food-based interventions to support management of chronic diseases

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“Let food be thy medicine and medicine be thy food.”

Hippocrates
UCSF-POH Research Partnership

California Senate Bill 97 creates Medi-Cal Medically Tailored Meals pilot

2014
Food=Medicine Pilot Study
• Pre-post design
• No control group
• n=72
• HIV and/or diabetes
• Follow up in 6 months

2015
Changing Health through Food Support (CHEFS) Study
• Randomized trial
• n=191
• HIV
• Follow up in 6 months

2016
Cardiac Recovery through Dietary Support (CaRDS) Study
• Randomized trial
• n=161
• Congestive heart failure
• Follow up in 1, 5 months

2017
Nutrition-Supported Diabetes Education Program (NU-DSMP)
• Randomized trial
• n=72
• Type 2 diabetes
• Follow up in 3, 6 months

2018
Changing Health through Food Support (CHEFS-DM)
• Randomized trial (ongoing)
• n=246
• Type 2 diabetes
• Follow up in 6, 12 months

2019
Medically supportive food now included as an optional covered benefit under Medi-Cal

2020

2021

2022

2023

Project Open Hand meals with love
Project Open Hand interventions (3-6 months)

- **Medically tailored meals**
  - Based on Mediterranean diet, compliant with heart- and diabetes-health guidelines

- **Medically supportive groceries** (primarily fresh foods)

- **Supplementary items** to round out nutritional intake, provide cooking supplies

**PLUS**

- **Medically tailored nutritional education**
  - Individual and/or group sessions with registered dietitians
### Table 4  HIV- and T2DM-specific study outcomes at baseline and follow-up

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
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<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Follow-up</td>
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<tr>
<td>HIV-specific outcomes</td>
<td></td>
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<tr>
<td>(n = 30)</td>
<td></td>
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<tr>
<td>Internalized HIV stigma</td>
<td>12.2 (4.28)</td>
<td>11.5 (4.10)</td>
<td>0.21</td>
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<tr>
<td>ART adherence ≥95%, %</td>
<td>46.7</td>
<td>70.0</td>
<td>0.046</td>
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<tr>
<td>T2DM-specific outcomes (n = 29)</td>
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<tr>
<td>Diabetes distress (range 1–6), mean (SD)</td>
<td>2.64 (0.905)</td>
<td>2.02 (0.777)</td>
<td>&lt;0.001</td>
<td></td>
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<tr>
<td>Perceived diabetes self-management score (range 8–40), mean (SD)</td>
<td>24.8 (6.35)</td>
<td>27.3 (6.73)</td>
<td>0.007</td>
<td></td>
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<tr>
<td>HbA1c %, mean (SD)</td>
<td>9.23 (2.61)</td>
<td>8.75 (1.95)</td>
<td>0.41</td>
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<tr>
<td>HbA1c &lt;7% (optimal control), %</td>
<td>10.3</td>
<td>19.2</td>
<td>0.08</td>
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<tr>
<td>Fasting glucose, mean (SD)</td>
<td>164 (86.1)</td>
<td>151 (80.5)</td>
<td>0.48</td>
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</table>
### CHEFS-HIV pragmatic RCT

<table>
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<tr>
<th>Outcome (retrospective period)</th>
<th>Adjusted OR for difference in differences</th>
<th>95% CI</th>
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<tbody>
<tr>
<td>Food insecurity (6 months)</td>
<td>0.23</td>
<td>0.09, 0.62</td>
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<tr>
<td>Depressive symptoms (2 weeks)</td>
<td>0.32</td>
<td>0.13, 0.83</td>
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<tr>
<td>≤90% ART adherence (7 days)</td>
<td>0.18</td>
<td>0.038, 0.82</td>
</tr>
<tr>
<td>Overnight hospital stay (90 days)</td>
<td>0.11</td>
<td>0.01, 0.09</td>
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<tr>
<td>Unprotected sex (90 days)</td>
<td>0.045</td>
<td>0.004, 0.52</td>
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Improved Heart Failure Quality of Life

<table>
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<tr>
<th>Metric</th>
<th>Coef. (95% CI), p-value</th>
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<tr>
<td><strong>Overall score</strong></td>
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<tr>
<td>1 month</td>
<td>11.37 (2.62 to 20.12), p=0.01</td>
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<tr>
<td>5 month</td>
<td>10.33 (1.45 to 19.21), p=0.02</td>
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<tr>
<td><strong>Clinical summary score</strong></td>
<td></td>
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<tr>
<td>1 month</td>
<td>14.39 (4.96 to 23.82), p&lt;0.001</td>
</tr>
<tr>
<td>5 months</td>
<td>12.86 (3.29 to 22.42), p=0.01</td>
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<tr>
<td><strong>Total Symptom domain</strong></td>
<td></td>
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<tr>
<td>1 month</td>
<td>14.42 (4.10 to 24.74), p=0.01</td>
</tr>
<tr>
<td>5 months</td>
<td>15.11 (4.64 to 25.58), p&lt;0.001</td>
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Change in KCCQ score (difference in differences)
Lower risk of all-cause hospital re-admission

- **Hazard ratio 30 days:**
  - Hazard ratio: 0.716, 95% CI: 0.319, 1.603
  - (p value = 0.417)

- **Hazard ratio 60 days:**
  - Hazard ratio: 0.496, 95% CI: 0.267, 0.976
  - (p value = 0.042)

- **Hazard Ratio 150 days (end of intervention):**
  - Hazard ratio: 0.571, 95% CI: 0.342, 0.954
  - (p value = 0.032)

- **Hazard ratio 270 days:**
  - Hazard ratio: 0.668, 95% CI: 0.427, 1.046
  - (p value = 0.078)

Cox proportional hazard model adjusted for baseline hospitalizations
Some future directions

- Implementation science studies to understand design, delivery, implementation, and uptake
- Promoting meaningful community leadership in Food-is-Medicine research and policy making
- Leveraging secondary data to reduce data collection burden
- Culture- and human-centered Food-is-Medicine interventions
- Integrating Food-is-Medicine with initiatives addressing
  - Other social determinants of health
  - Community development
  - Sustainable food systems
Food = Medicine Pilot: Perceived Impacts (Diabetes)

- **DM health**: “The diabetes changed, the numbers. The number because if you eat that kind of food every day, like I did it, the number changes a lot. A lot. A lot…The sugar is more low…Before the program I tested sometimes 200, 220…Over here it go down [to] 130.”

- **Nutrition**: “But I’m realizing I’m buying more vegetables and stuff now than I did before the program. …The program had an effect on the fact of my buying vegetables… I realized that you got to have them…Vegetables are really vital for your health. They really are.”
Food = Medicine Pilot: Perceived Impacts (Diabetes)

- **Mental Health**: “You stress about some food. You don't have no money, and get caught...Now I feel more better...I get my food. My food is right there when I hungry. I don't have to be stressing.”

- **Health-behaviors**: “I was able to eat something rather than put it off to take the medicine...Before I missed a lot of medicine...some medicine you need to eat before and...now I can just take some portion of my plate and heat it up to take my medicine.”