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# Development of a Nutrient Profile Model for Processed Foods in Japan: A Localization Strategy Considering Nutritional Standards and Food Culture

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# Background & Challenge

Nutrient profiling (NP) is defined as "the science of **classifying** or **ranking** foods according to their nutritional composition for reasons related to preventing disease and promoting health". — WHO (2021)

- Many nutrient profile models (NPMs) exist worldwide.

Ranking

Scoring models :



Threshold models :



Classifying

- The evaluation of food "healthiness" using scoring models is accelerating globally. (e.g., the Global Index by ATNI).
- There is no official nutrient profile model in Japan.
- Some products, such as seasonings, are difficult to evaluate

Therefore, a new evaluation model suited to Japan is needed.

# The Challenge in Japan

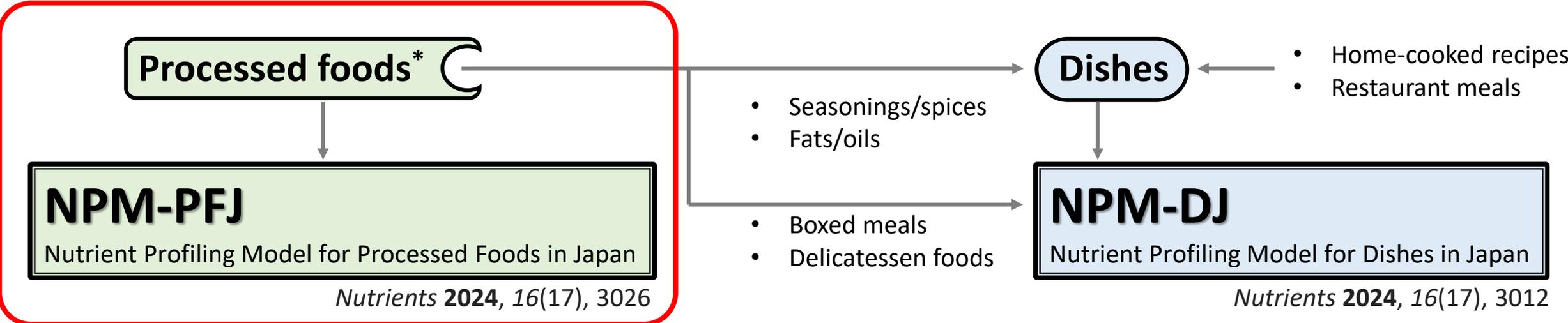
- Japan lacks an official nutrient profile model (NPM).
- Challenge: Foreign models do not align with Japanese food culture or nutritional policies.
- Need for a model tailored to the Japanese population and dietary habits.



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# Objective & Scope of NPM-PFJ (1.0)

- Objective: Development of NPM for processed foods in Japan (NPM-PFJ).
- Target: Japanese adults (18+ years).
- Nutrients: Energy, Protein, Sodium, Saturated fat, Dietary fiber, Sugars, and FVNL (Fruits, Vegetables, Nuts, and Legumes).
- Unit: Per 100 g (mL).



# Overall Strategy for Localization

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**1. Selection:** Choose a globally recognized base model.



**2. Adaptation:** Replace values with Japanese standards.



**3. Categorization:** Define categories reflecting Japanese dietary culture.

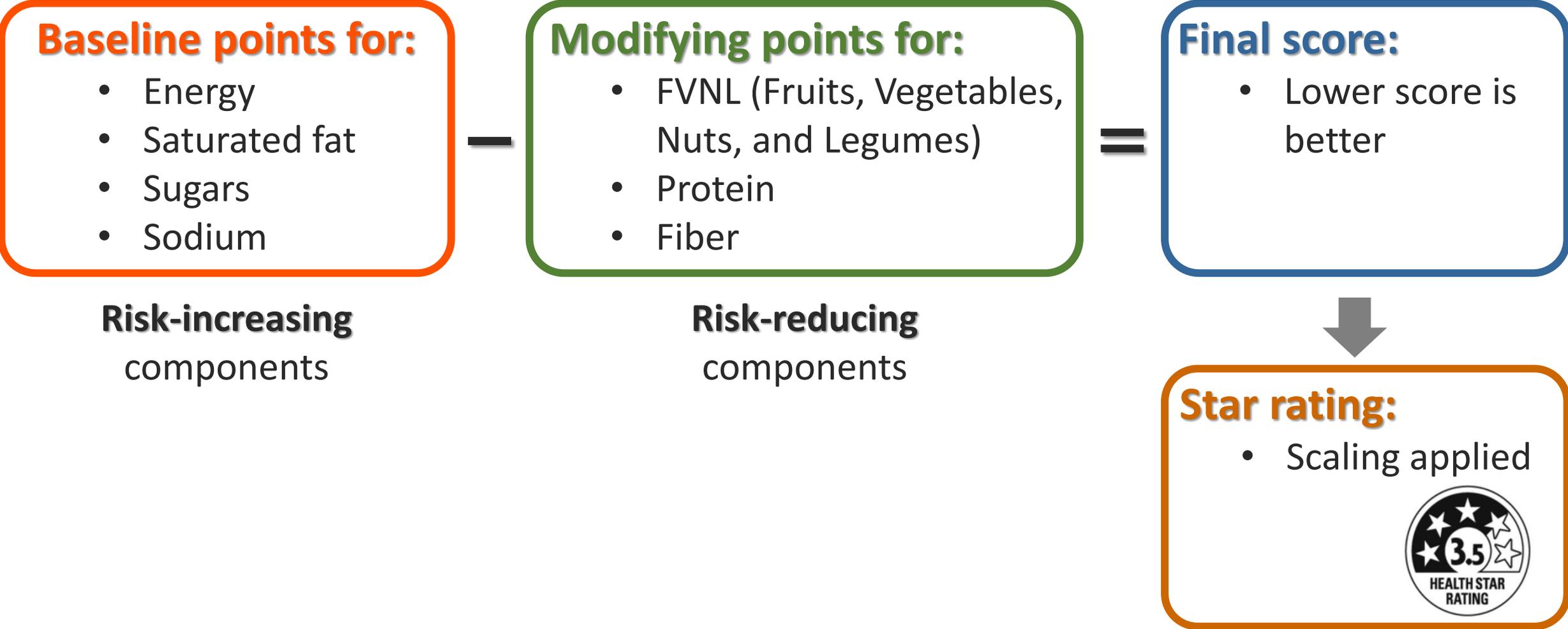
# Strategy 1: Selecting the Reference Model

- Selected: Health Star Rating (HSR) system (Australia/New Zealand).



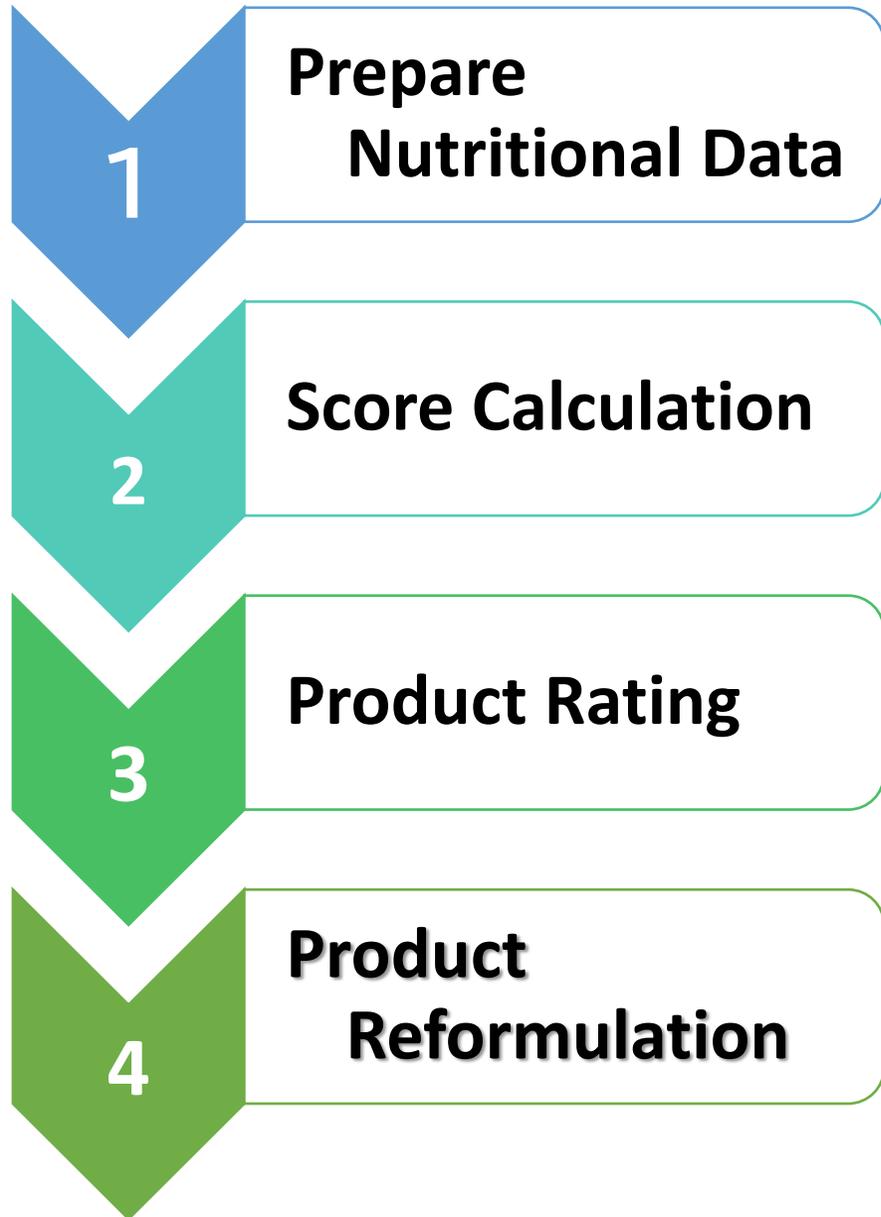
- Reasoning:
  - Algorithm is **transparent** and **traceable**.
  - Numerical basis** can be adapted to Japanese recommendations.
  - Evaluates nutrients consistent with Japanese policies.

# Health Star Rating: How are health stars calculated?



***NPM-PFJ adopts this HSR mechanism.***

# Evaluation Process of the NPM-PFJ (ver. 1.0)





**1**

Regular white bread

| Nutrition Information: |          | Scoring |   |
|------------------------|----------|---------|---|
| (Per 100 g)            |          |         |   |
| Energy                 | 250 kcal | →       | 3 |
| Protein                | 8.9 g    | →       | 3 |
| Fat                    | 4.1 g    |         |   |
| -Sat. Fat              | 1.5 g    | →       | 2 |
| Carbohydrate           | 46.4 g   |         |   |
| -Available CHO         | 42.2 g   |         |   |
| -Sugars                | 5.3 g    | →       | 2 |
| -Dietary fiber         | 4.2 g    | →       | 5 |
| Salt equivalent        | 1.2 g    | →       | 4 |
| Vegetables etc.        | 0 %      | →       | 0 |

**2**

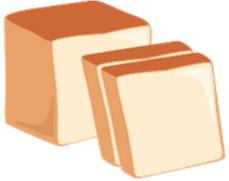
Final score

**3**

★★★★☆☆

**3**





**Final score**

**2**

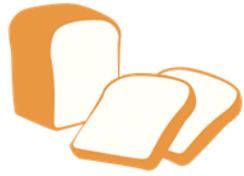
★★★★☆☆

**4**

**Reduced-salt white bread**

(Salt equivalent **1.2** → **0.8** g/100 g)

# Scoring algorithm of the NPM-PFJ (ver. 1.0)



Regular  
white  
bread

## Nutrition Information: (Per 100 g) Scoring

|                 |          |   |   |
|-----------------|----------|---|---|
| Energy          | 250 kcal | ➔ | 3 |
| Protein         | 8.9 g    | ➔ | 3 |
| Fat             | 4.1 g    |   |   |
| -Sat. Fat       | 1.5 g    | ➔ | 2 |
| Carbohydrate    | 46.4 g   |   |   |
| -Available CHO  | 42.2 g   |   |   |
| -Sugars         | 5.3 g    | ➔ | 2 |
| -Dietary fiber  | 4.2 g    | ➔ | 5 |
| Salt equivalent | 1.2 g    | ➔ | 4 |
| Vegetables etc. | 0 %      | ➔ | 0 |

|       | Energy<br>kcal/100 g (ml) | Saturated fat<br>g/100 g (ml) | Sugars<br>g/100 g (ml) | Sodium<br>mg/100 g (ml) |
|-------|---------------------------|-------------------------------|------------------------|-------------------------|
| Point |                           |                               |                        |                         |
| 0     | ≤83                       | ≤0.6                          | ≤2.1                   | ≤103                    |
| 1     | >83                       | >0.6                          | >2.1                   | >103                    |
| 2     | >166                      | >1.2                          | >4.2                   | >206                    |
| 3     | >249                      | >1.8                          | >6.3                   | >309                    |
| 4     | >332                      | >2.4                          | >8.4                   | >412                    |
| 5     | >415                      | >3.0                          | >10.5                  | >515                    |
| 6     | >498                      | >3.6                          | >12.6                  | >618                    |
| 7     | >581                      | >4.2                          | >14.7                  | >721                    |

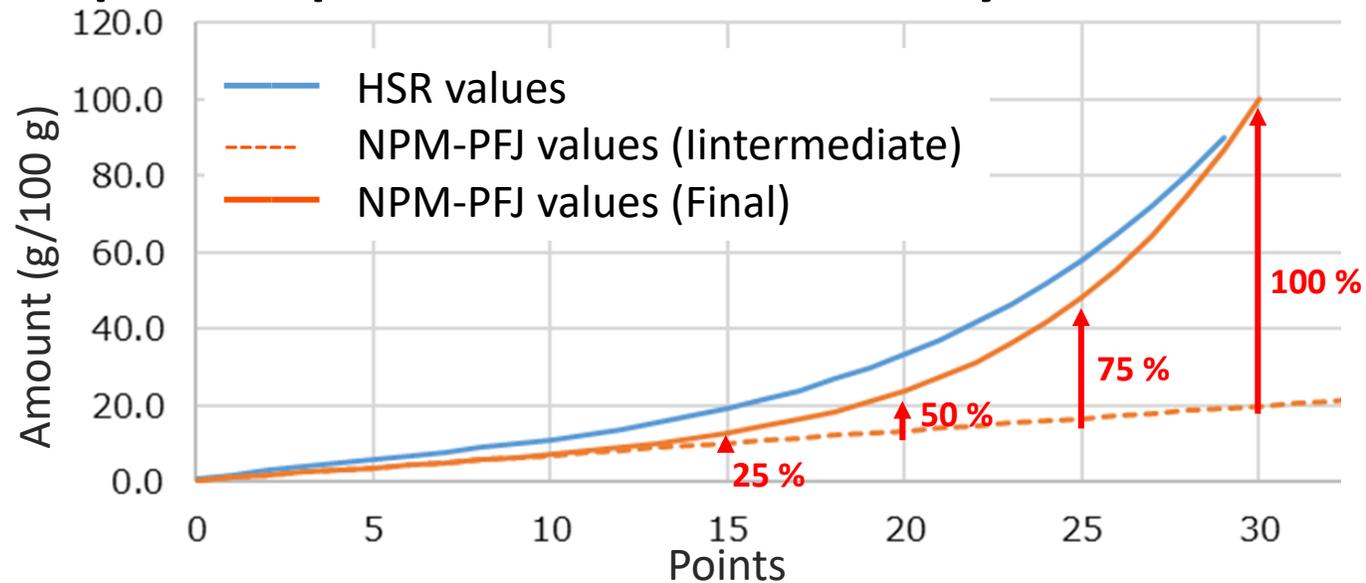
- **Base points = Energy + Sat. fat + Sugars + Sodium = 11**
- **Modification points = FVNL (Vegetable etc.) + Protein + Dietary fib. = 8**
- **Final score = Base points - Modification points = 11 - 8 = 3**

*Note: A lower final score indicates a healthier nutritional profile.*

# Strategy 2: Adaptation to Japanese Standards

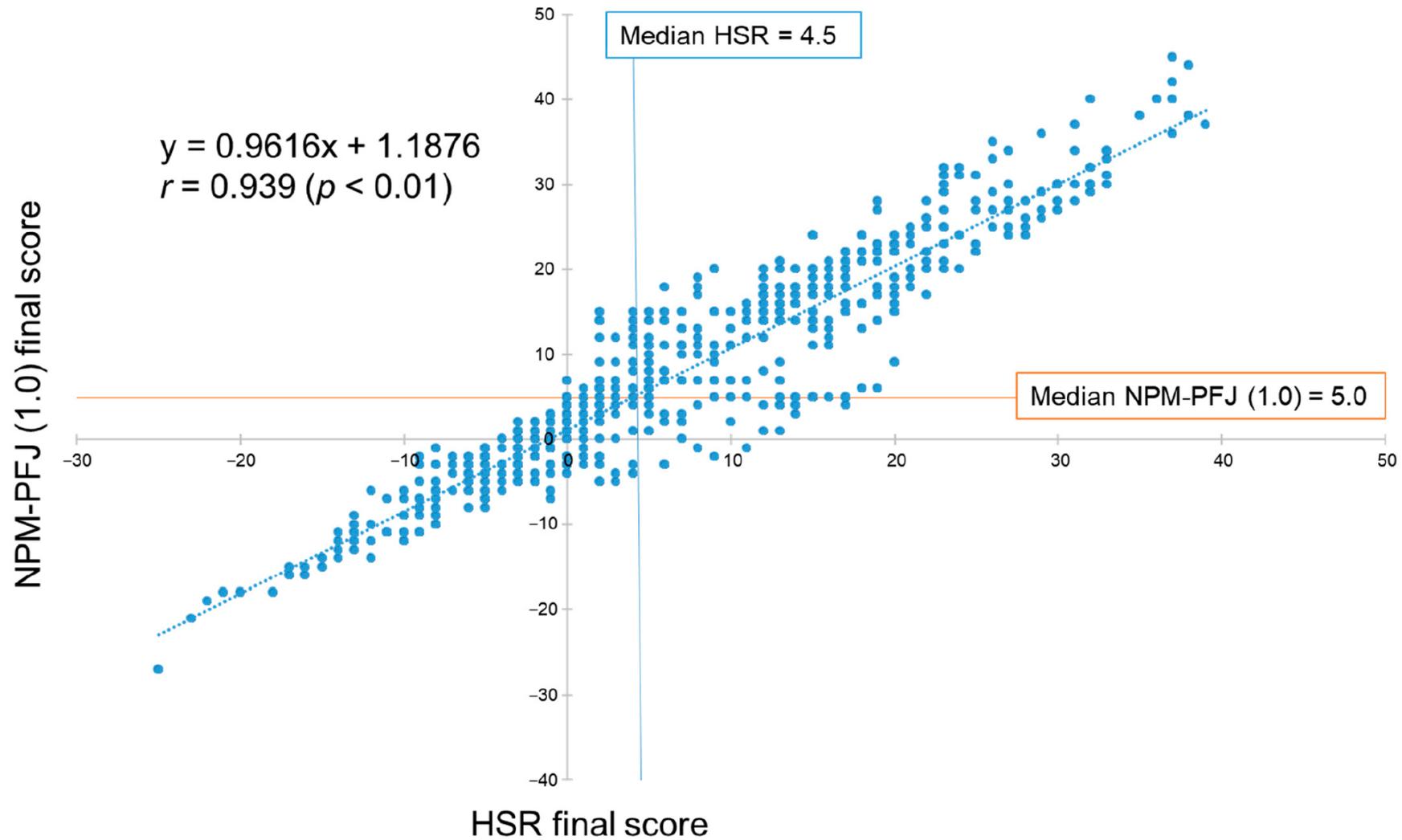
- Kept the HSR structural algorithm.
- Revised reference values based on:
  - Dietary Reference Intakes (DRIs) for Japanese (2020).
  - Nutrient Reference Values (NRVs) for Japanese (2015).
  - Health Japan 21 (third term) goals (2023).

## Example: Adaptation of Saturated Fatty Acids



- **HSR:** Based on UK standards for children (11-16 years).
- **NPM-PFJ (1.0):** Adjusted using Japanese DRIs and NRVs (18+ years) for adults.

# Validation: Correlation with HSR



***NPM-PFJ (1.0) is both Japanese-specific and scientifically consistent with global standards.***

# Strategy 3: Categorization Issue

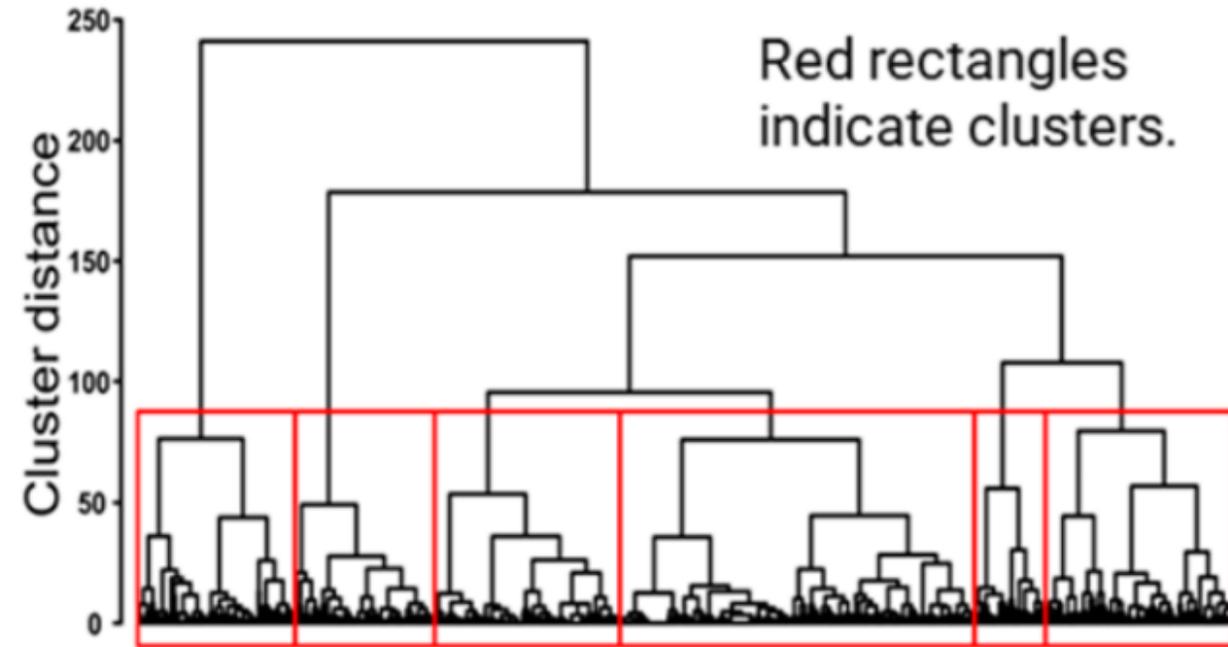
- HSR Categories: 3 out of 6 are dairy-focused (Milk, Dairy, Cheese).

|   |                                                               |    |                                             |
|---|---------------------------------------------------------------|----|---------------------------------------------|
| 1 | Non- dairy beverages, jellies and water-based ice confections | 1D | Milk and Dairy beverages (and alternatives) |
| 2 | Foods                                                         | 2D | Dairy foods (and alternatives)              |
| 3 | Oils and Spreads                                              | 3D | Cheese                                      |

- **Inconsistency:** Does not match the importance of diverse processed foods in Japan.
- **Requirement:** Categories that are "meaningful" to Japanese consumers and industry.

# Approach: Cluster Analysis

- **Method:** Hierarchical cluster analysis (Ward's method).
- **Dataset:** 668 processed foods from the Standard Tables of Food Composition in Japan.
- **Goal:** Group foods with similar nutrient scoring patterns
- **Outcome:** Identified **6 distinct categories**.
- **Implication:** Foods in the same category share similar nutritional characteristics.



# Results: Six Unique Food Categories

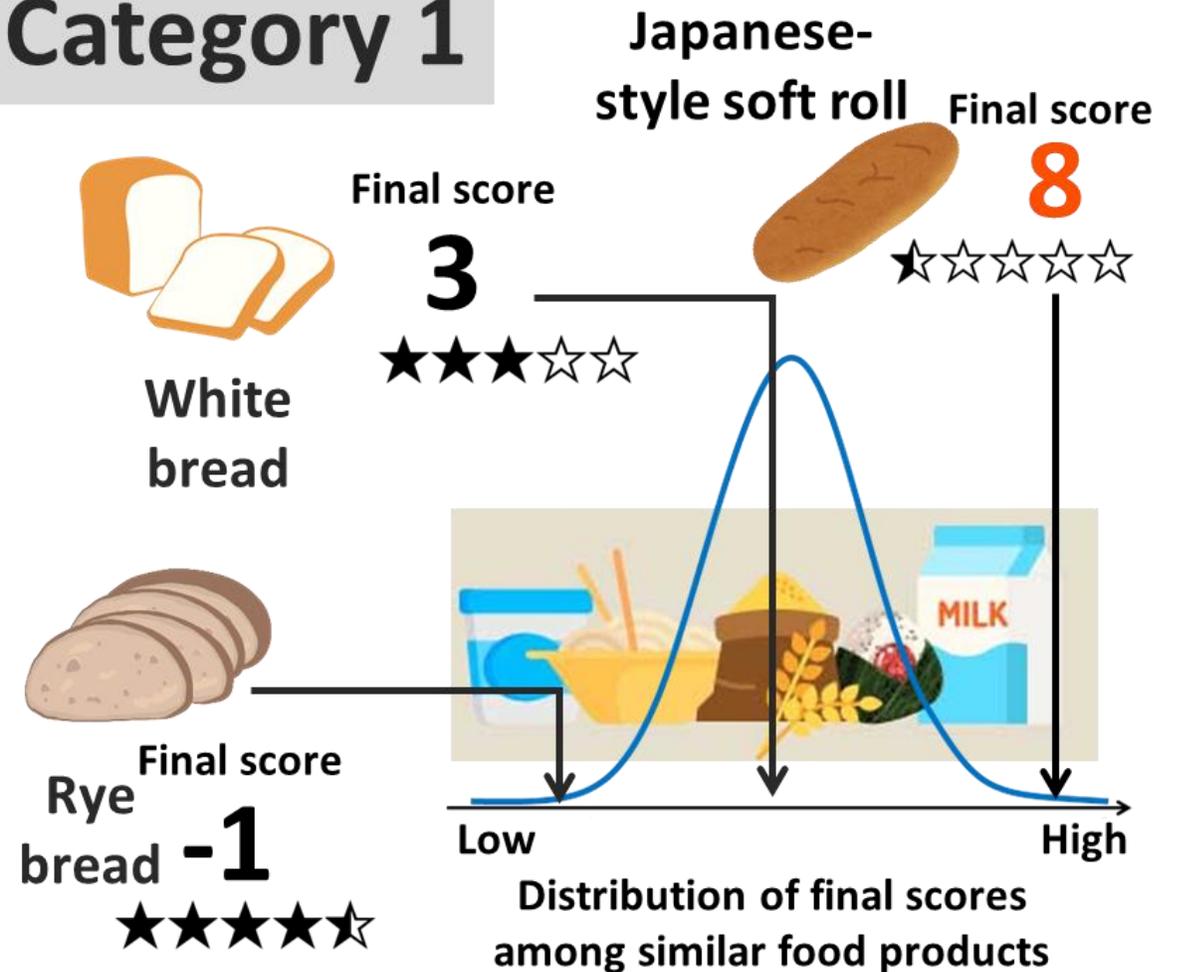
*Six food categories were defined based on Japanese dietary culture and scientific attributes.*

- **Cat 1: Miscellaneous**
- **Cat 2: Processed Soy Products & Nuts/Seeds**  
High in energy, protein, and dietary fiber
- **Cat 3: Processed Meats, Cheese, Infant Formula, Western Sweets**  
High in saturated fat
- **Cat 4: Dried Noodles, Pickled Vegetables, Dried/Preserved Seafood**  
High in sodium
- **Cat 5: Processed Potatoes, Vegetables, Fruits, Mushrooms, Seaweed**  
High in FVNL (Fruits, Vegetables, Nuts, and Legumes)
- **Cat 6: Dried Fruits, Jam, Japanese Sweets, Candies**  
High in sugars

# Rating System: Relative Evaluation

- Rating (0.5 to 5.0 stars) based on final score distribution.
- Calculation: Use 10th percentile increments within each category.
- Relative comparison within the food category (similar food products).

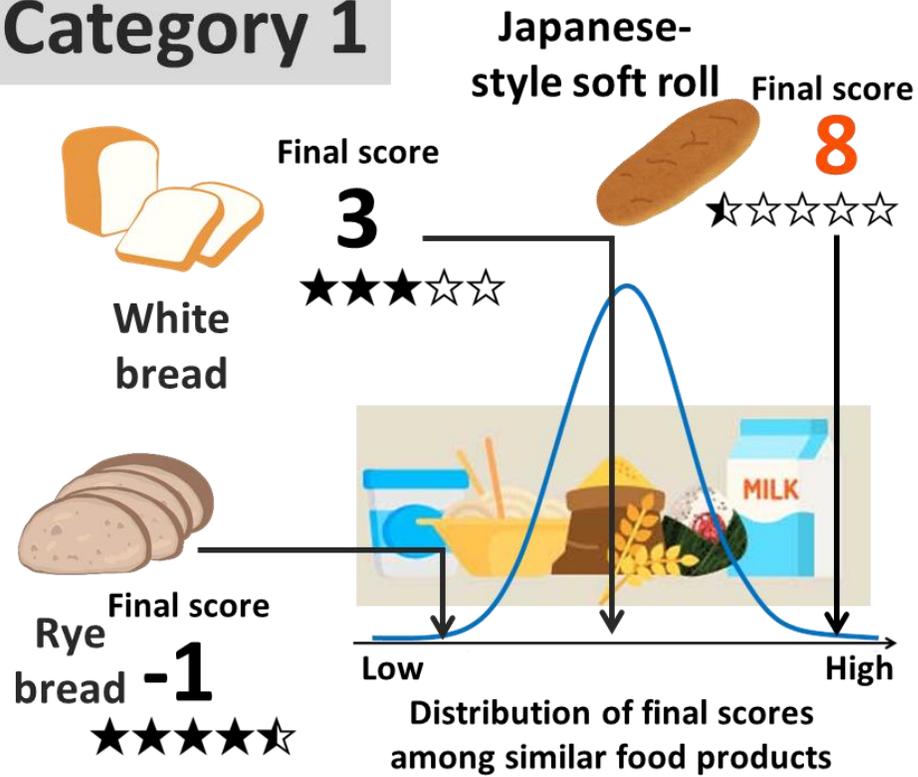
## Category 1



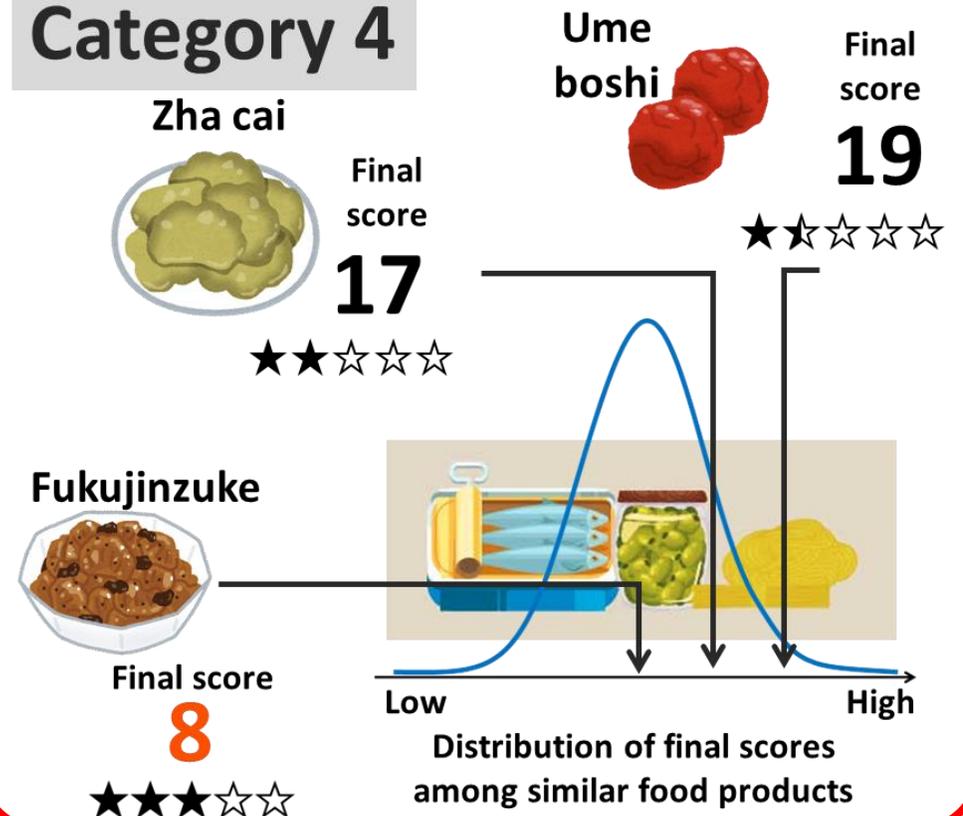
# Focus: Category 4 (Sodium-Rich Foods)

- Category 4: High Sodium Foods (Pickles, Dried fish)
- **Goal:** Promote Reformulation **within** the food category.

## Category 1



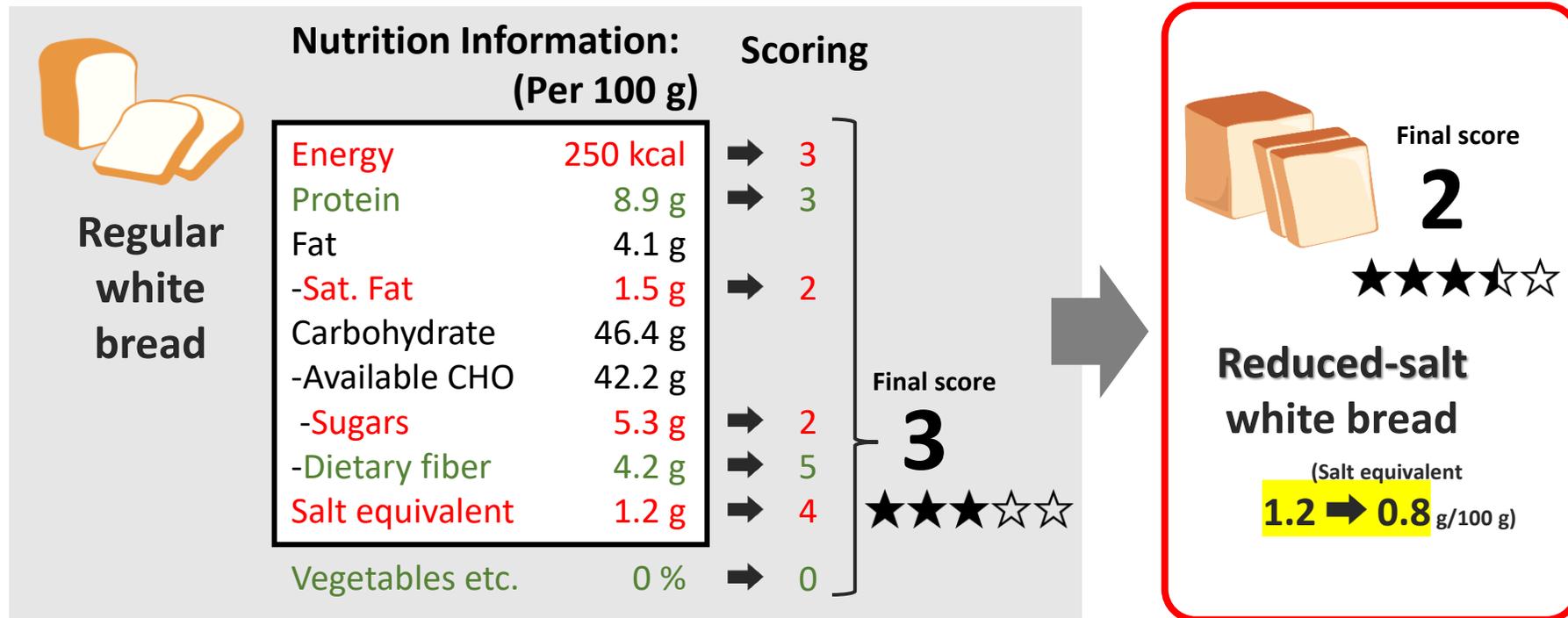
## Category 4



# Implementation: Encouraging Reformulation

Example: White Bread.

- Regular salt content (1.2 g/100 g) → Rating: 3.0 stars.
- Reduced salt content (0.8 g/100 g) → Rating: 3.5 stars
- **Impact:** Visually demonstrates the health benefit of reformulation to industries.



# Applicability to Other Asian Countries

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## *Process > Product*

- Use the same process, not the same results.
- Input your national data (DRIs/NRVs).
- Reflect your own food culture in categories.

***The Methodology is Transferable.***



# Limitations & Future Directions

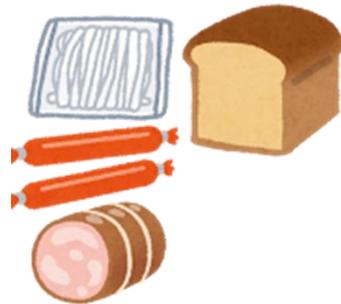
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- **Current Status:** Version 1.0 is based on the Standard Tables of Food Composition in Japan.
- **Next steps:**
  - Include more product variations in the market.
  - Refine algorithms for specific foods (e.g., dried noodles).
- **Ongoing Research:** FY2025-2027 MHLW research project .

# Summary & Transition

- **NPM-PFJ:** A localized and scientific tool for Japan's health strategy.
- **Goal:** Support consumers' health through industry reformulation.
- **Next presentation:** NPM for "Dishes" (NPM-DJ) by Dr. TOUSEN.

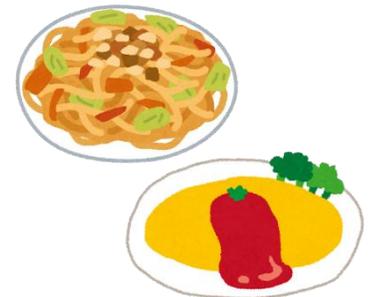
(1) Improve the **quality** of ingredients (e.g., processed foods)



**NPM-PFJ**

Nutrient Profiling Model for Processed Foods in Japan

(2) Combine ingredients properly to prepare a dish, and eat **proper amounts**



**NPM-DJ**

Nutrient Profiling Model for Dishes in Japan

***Thank you very much for your attention !***

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