

2016 ILSI Annual Meeting

**Regional Differences In Food Patterns And
Health Implications**

Asian Dietary Patterns and Health Outcomes

**Geok Lin Khor PhD
Professor Emeritus
Universiti Putra Malaysia
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Outline of presentation

- Diet-related non-communicable disease landscape of Asia
- Evidence of dietary patterns and health outcomes in Asian countries
- Concluding remarks

- The population of Asia was estimated at 4.32 billion in 2015, accounting for **60% of the world's population**
- Asia also has the **highest growth rate today**, and its population quadrupled during the 20th century.



A total of 51 countries with **huge diversities**: economically, culturally, in health status, etc

Diversity in economic and health status

	GNI per capita (2014) USD	Life expectancy at birth (2013) Years		Age standardized death rate per 100,000 population All NCDs (2012)	
		Male	Female	Males	Females
Japan	42,000	80.2	87.2	333	174
Korea Republic	27,090	78.3	84.7	415	221
Malaysia	10,760	71.7	76.4	619	509
China	7,380	74.1	77.0	651	509
Thailand	5,370	71.5	78.8	560	358
Indonesia	3,630	68.8	72.8	600	300
Philippines	3,470	74.1	72.5	899	578
India	1,570	64.7	68.2	785	587
Bangladesh	1,080	64.7	71.8	564	532
United States	55,200	76	81	489	350

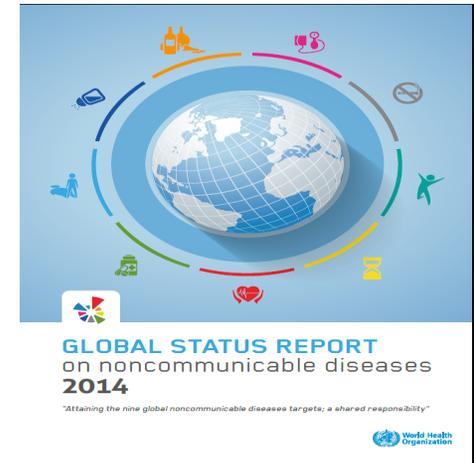
Diversity in CVD risks (Age-standardized adjusted estimates) (WHO, 2014)

	Prevalence of raised blood glucose (fasting glucose ≥ 7.0 mmol/l (126 mg/dl) or on medication or with a history of diagnosed diabetes)		Prevalence raised blood pressure (SBP ≥ 140 and/or DBP ≥ 90)		Overweight (BMI ≥ 25 kg/m ²) 18+ years	
	Males	Females	Males	Females	Males	Females
Japan	8.9	5.8	28.3	23.1	27.2	19.4
Korea Republic	8.6	6.3	14.4	11.3	32.7	26.6
Malaysia	10.7	9.8	22.4	16.9	32.7	36.0
China	8.7	7.3	21.1	18.4	31.1	29.1
Thailand	8.6	9.1	24.4	22.9	22.7	30.1
Indonesia	7.7	8.4	22.0	20.7	17.3	25.2
Philippines	6.5	7.1	19.8	17.4	18.9	24.2
India	9.1	8.8	23.4	22.6	17.3	22.3
Bangladesh	8.8	8.5	22.0	21.0	13.5	18.8
United States	8.6	6.9	17.5	12.3	72.1	62.6

Globally, non-communicable diseases **NCD deaths are projected to increase from 38 million in 2012 to 52 million by 2030.**

Most NCDs are strongly associated and causally linked with four behaviours:

- (i) tobacco use
- (ii) physical inactivity
- (iii) unhealthy diet**
- (iv) the harmful use of alcohol



**Global Status Report
NCD 2014; WHO**

Dietary patterns and CVD outcomes: global evidence

Dietary patterns and CVD: a systematic review and meta-analysis of observational studies

Rodríguez-Monforte et al., Brit J Nutr, 114, 1341–1359, 2015

Included 22 studies conducted in Europe (7), America (5), Australia (1) & **Asia (6)** in 2000-2014.

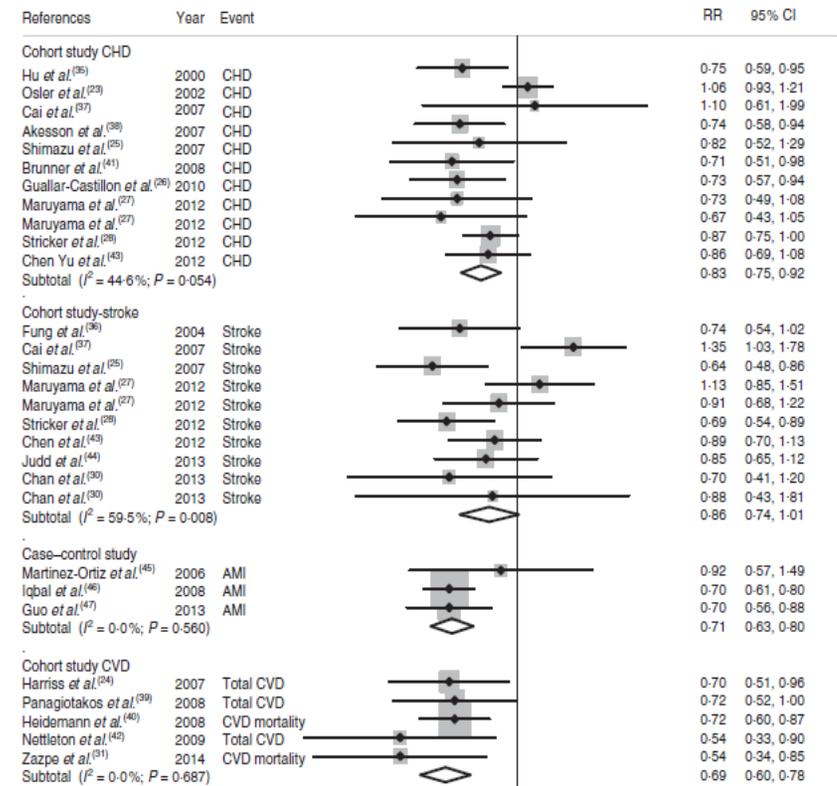
Evaluated the risk of CVD in the highest compared with the lowest categories of prudent/healthy and western/unhealthy dietary patterns.

(i) the **prudent/healthy dietary pattern** with high loadings for vegetables, fruit, legumes, whole grains, fish and poultry

(ii) the **western/unhealthy pattern** included high loadings for red and processed meat, refined grains, French fries, sweets, desserts, high-fat dairy products and alcohol.

Rodríguez-Monforte et al., 2015

- Pooled relative risk (RR) for **CVD, CHD and stroke** was 0.69, 0.83 and 0.86 respectively of the highest to the lowest category of **prudent/healthy dietary patterns** in cohort studies.
- Pooled RR for CVD, CHD and stroke was 1.14, 1.03 and 1.05 respectively, of the highest to the lowest category of **western dietary patterns** in cohort studies.
- **Results support the evidence of the prudent/healthy pattern as a protective factor for CVD.**



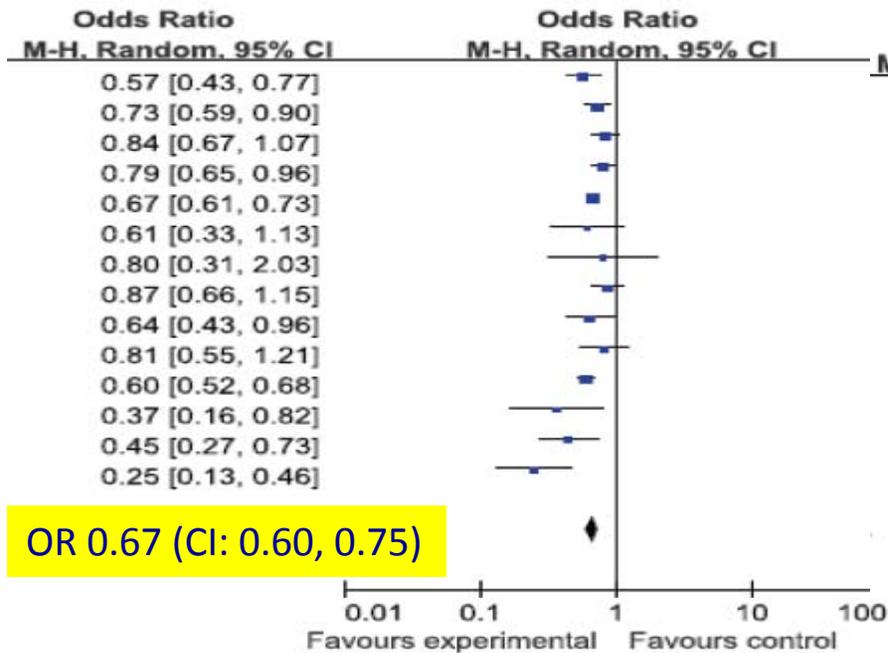
pooled RR for CVD: 0.69 (95 % CI 0.60, 0.78)

Dietary patterns, alcohol consumption and risk of coronary heart disease in adults: A meta-analysis

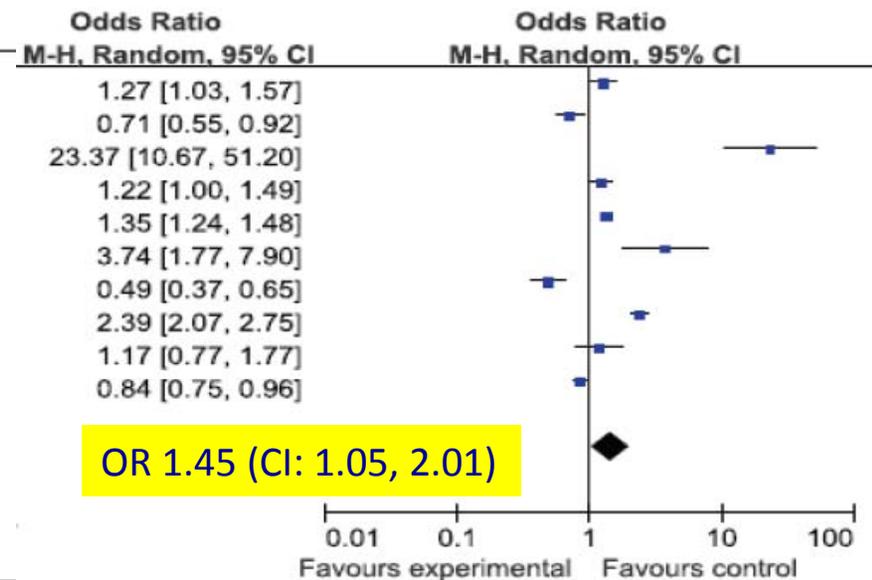
Zhang et al., Nutrients, 7:6582-6605, 2015

- Included a total of 35 articles: EU (15), US (9), **Asia (9)**, NZ (1) Multiple countries (1)
- **Healthy/prudent dietary patterns** characterised by high intake of vegetables, fruits, whole grains, olive oil, fish, soy, poultry and low fat dairy.
- **Unhealthy/Western-type dietary patterns** characterized by high consumption of red and/or processed meat, refined grains, sweets, high-fat dairy products, butter, potatoes and high-fat gravy, and low intakes of fruits and vegetables.

Forest plot of the highest compared with the lowest categories of intake of the **healthy/prudent dietary patterns and coronary heart disease**



Forest plot of the highest compared with the lowest categories of intake of the **unhealthy/Western-type dietary patterns and CHD risk**.



(Zhang et al., 2015)

Dietary Patterns and Health Outcomes

East Asia: Japan, China, Republic of Korea

Dietary patterns and suicide in Japanese adults: the Japan Public Health Center-based Prospective Study

Nanri et al., British J Psychiatry 203: 422–427, 2013.

- Total of 40,752 men & 48,285 women took part in the second survey of the **Japan Public Health Center–based Prospective Study** (1995–1998).
- In a follow-up for a mean of 8.6 years, 163 cases (107 men and 56 women) of death by suicide were included in the analysis.
- Among both men and women, a **‘prudent’ dietary pattern** characterised by a high intake of vegetables, fruits, potatoes, soy products, mushrooms, seaweed and fish was associated with a **decreased risk of suicide.**

Nanri et al., 2013.

- “Previous findings of an inverse association between similar dietary patterns and depression, which is a major precondition of suicide –in Japan, France, Australia.
- Fruits and vegetables are rich in nutrients such as folate and antioxidant vitamins, which have been shown to be associated with decreased prevalence of symptoms of depression.
- Folate is involved in the metabolism of monoamines such as serotonin in the brain and is hypothesised to protect brain functions by reducing levels of homocysteine, which exerts neurotoxic effects through several mechanisms.”

✓ **Westernised dietary pattern** - meat, processed meat, bread, dairy products, coffee, black tea, soft drinks

✓ **Traditional Japanese dietary pattern** - salmon, salty fish other sea foods, pickles

Not significantly associated with suicide risk

Dietary patterns and cardiovascular disease mortality in Japan: a prospective cohort study

Shimaju *et al.*, Int J Epidemiol 36:600–609, 2007

- Dietary information was collected from 40,547 Japanese men and women aged 40–79 years at baseline in 1994
- During 7 years of follow-up, 801 participants died of CVD.

(i) a Japanese dietary pattern

soybean products, fish, seaweeds, vegetables, fruits & green tea

(ii) an 'animal food' dietary pattern

beef, pork, ham, sausage, chicken, liver and butter

(iii) DFA dietary pattern

dairy products (milk and yoghurt), margarine, fruits & vegetables (carrot, pumpkin and tomato), and low intake of rice & alcoholic beverages

Shimaju *et al.*, 2007

- The **Japanese dietary pattern** was significantly associated with a **decreased risk of CVD mortality**.
- The **'animal food' dietary pattern** was significantly associated with an **increased risk** of CVD mortality
- The **DFA dietary pattern** was **not associated** with CVD risk.

A Japanese diet and 19-year mortality: the NIPPON DATA80 and its Trends in the Aged, 1980

Nakamura et al Brit J Nutr 101: 1696–1705, 2009

- The 1980 (NIPPON DATA80) database includes more than 10,000 participants from randomly selected regions in Japan.
- Analyzed all-cause mortality and CVD mortality trends with scores for a **Japanese Reduced-Salt Diet**.

Nakamura & Ueshima. 2014

“Reduced Salt Japanese Diet”

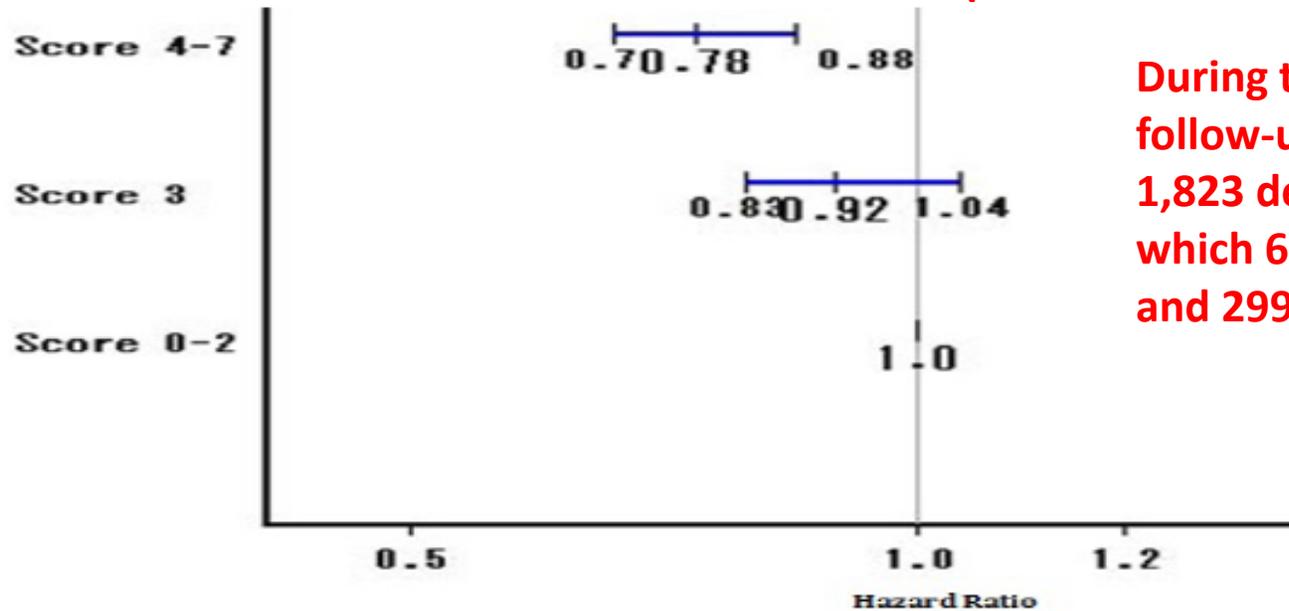
- If any single dietary component was part of a typical daily diet, it was scored as one and zero otherwise. Thus, the total score ranged from 0 to 7, with 0 being least healthy and 7 being most healthy
1. ≤ 2 eggs/week
 2. Fish \geq once in 2 days
 3. Meat ≤ 2 times/week
 4. Tsukemono (pickled vegs) \geq once/day
 5. Soup with noodles infrequently;
 6. Use of low salt soy products, and
 7. Occasional drinking



Tsukemono

All-Cause Mortality

(Nakamura & Ueshima, 2014)



During the 19 years of follow-up, there were 1,823 deaths, out of which 654 from CVD, and 299 from stroke

Figure 2: Hazard Ratio for All-cause Mortality According to Reduced-Salt Japanese Diet Score.

As the score increased, risk of death from all-cause declined significantly.

A prospective study of dietary patterns and mortality in Chinese women.

Cai et al., Epidemiology 18(3):393-401, 2007

- The **Shanghai Women's Health Study** is a cohort study of 74,942 women age 40-70 years at baseline (1996 - 2000).
- After an average of 5.7 years of follow-up, there were 1,565 deaths.
- Based on a FFQ of 71 food groups, 3 major dietary patterns were derived:
 - **vegetable-rich** (green beans, long beans, egg plant, celery)
 - **fruit-rich** (oranges, grapefruit, apples, pears, banana, watermelon)
 - **meat-rich** (meat, animal parts and animal organs).

Cai et al (2007)

- An **inverse association was** observed between the **fruit-rich diet** and
 - all causes of mortality (HR 0.94 (95% CI : 0.89-0.98))
 - CVD HR 0.89 (0.81-0.99)
 - Stroke 0.79 (0.69-0.91)
 - Diabetes 0.51 (0.39-0.65)
- The **meat-rich diet** was associated with **increased risk of diabetes**: HR = 1.18 (0.98-1.42) and mortality **from colorectal cancer**
- The **vegetable-rich diet** was associated with a **modestly-decreased risk** of death from **colorectal cancer**.

Dietary Patterns Are Associated with Stroke in Chinese Adults

Li et al., *J. Nutr.* 141: 1834-183, 2011

Examined risk of stroke among 26,276 Chinese adults aged ≥ 45 yrs from the 2002 **China National Nutrition and Health Survey**

- (i) the **traditional northern dietary pattern** characterized by high intakes of refined cereal products, potatoes, and salted vegetables (rural)
- (ii) the **traditional southern dietary pattern** characterized by high intakes of rice and vegetables, seafood, and moderate intakes of pork and poultry (rural).
- (iii) the **Western dietary pattern** with high consumption of beef, fruit, eggs, poultry, seafood, milk products, cakes, beverages, nuts, beer and wine (urban)

Li et al (2011)

Compared to the traditional southern dietary pattern:

- **the traditional northern dietary pattern associated with increased risk of stroke**, adjusted OR = 1.59 (1.16–2.17); P = 0.004].
- **the Western dietary pattern was not significantly associated** with risk of stroke, after adjustment for obesity, hypertension, hyperglycemia, and dyslipidemia.

The prevalence of stroke is lower in the southern than in the northern areas of China, varying from 1,249–1,285/100,000 in northern areas to 95/100,000 in the south (Liu et al., 2007).

Dietary Patterns and Risk for Metabolic Syndrome in Korean Women. A Cross-Sectional Study.

Choi et al., Medicine 94(34) : e1424, 2015

A total of 5,931 female participants were recruited from a health screening examination at **the National Cancer Center** in 2007 - 2014.

1. **“Traditional” dietary pattern** characterized by high intake of vegetables, condiments, shellfish, mushrooms, seaweed, fish, tubers, & *kimchi*.
2. The **“western” dietary pattern** characterized by high intake of red meat, oil, cake/pizza, noodles, poultry, processed meats, bread, sweets and by low intake of grains.
3. The **“prudent” dietary pattern** characterized by high intake of fruits and fruit products, nuts and dairy products, as well as low consumption of grains

Choi et al (2015)

- The highest quintile of the **prudent dietary pattern was sig less likely to develop MetS** (OR: 0.5) compared with the lowest quintile.
- The **prudent pattern** was also **negatively associated** with all of the MetS diagnostic criteria: abdominal obesity (OR: 0.52), blood pressure (OR: 0.72), triglycerides (OR: 0.67), fasting glucose (OR: 0.64, & HDL chol (OR: 0.53).
- The **“traditional” and “western”** dietary patterns were **not associated** with the risk of MetS.
- “Compared to the western diet, the traditional Korean diet consists of a variety of vegetables and is low in fat, but it includes high sodium and carbohydrate intakes.”

Rice-eating pattern and the risk of metabolic syndrome especially waist circumference in Korean Genome and Epidemiology Study (KoGES)

Y. Ahn et al., BMC Public Health 13:61, 2013

- Participants were 26,006 subjects enrolled in the KoGES, 2004 - 2006.
- Four rice-eating patterns identified:
 - white rice
 - rice cooked with beans (green peas, black soybeans, red beans)
 - rice with multi-grains (barely, sorghum, glutinous rice, oats, millet)
 - rice with mixed beans and grains
- The **risk for MetS was lower in the rice with beans and rice with multi-grains groups** compared with the white rice group, particularly in postmenopausal women.



“Kongbap” Rice with beans



“Japgokbap”

Rice with multi grains



Dietary Patterns and Health Outcomes

South Asia: India, Bangladesh, Pakistan

Diet patterns are associated with demographic factors and nutritional status in South Indian children

Kehoe et al., *Maternal and Child Nutrition* 10: 145–158, 2014

- Children were recruited from the **Mysore Parthenon study**, a birth cohort to investigate long-term CVD risk outcomes associated with maternal gestational diabetes & body composition of the new-born.
- A total of 539 children at about 9.5 years of age participated in 2007.
- A 136-item FFQs developed based on responses to 24 h recalls was administered.
- Two dietary patterns identified:
 - **Snack and fruit diet**
 - **Lacto vegetarian diet**

Kehoe et al (2014)

- The **snack and fruit diet** characterized by high intakes of snacks, fresh fruit, sweetened drinks, rice and meat dishes, noodles and bread.
- The **lacto-vegetarian diet** characterized by high intakes of finger millet, traditional rice & vegetable dishes, yoghurt
- The **snack and fruit pattern was negatively associated with child adiposity.** This diet comprised healthy and unhealthy aspects, e.g micronutrients from fruits but also higher levels of fat and sugar.
- **The lacto-vegetarian pattern was not associated with adiposity;**



Major dietary patterns and their associations with cardiovascular risk factors among women in West Bengal, India.

Ganguli et al., British J Nutrition 105, 1520–1529, 2011.

A cross-sectional study of 701 women aged 35 years and above.

1. The **'vegetable, fruits and pulses' pattern** characterized by high intakes of dark-yellow and green leafy vegetables, sweets, fruits, pulses, nuts, eggs
2. The **'hydrogenated and saturated fat and vegetable oil' pattern** characterized by high intakes of butter, hydrogenated oil, ghee, vegetable oil, mustard oil, condiments, sweets, fish, high-fat dairy and refined grain
3. The **'red meat and high-fat dairy' pattern** characterized by high intakes of red meat, high-fat dairy products, whole grain, high-energy drinks, and low intakes of fish, and refined grain (low carb)

Ganguli et al (2011)

- The **vegetables, fruits and pulses pattern was inversely associated with CVD biomarkers**: serum total cholesterol (TC), LDL-cholesterol and non-HDL-cholesterol (HDL-C) concentrations ($P < 0.05$ for all).
- The **hydrogenated and saturated fat and vegetable oil pattern was positively associated** with BMI, waist circumference (WC) and HDL-C concentration ($P < 0.05$ for all).
- **No significant association between the red meat and high-fat dairy** pattern with any of the risk variables. This pattern was associated with lower income and most of the food items were only consumed weekly or monthly and not in high amounts.

Prospective investigation of major dietary patterns and risk of cardiovascular mortality in Bangladesh.

Chen et al. Int J Cardiol 167, 1495–1501, 2013.

- Prospective cohort analysis of 11,116 participants enrolled in the **Health Effects of Arsenic Study in Araihasar, Bangladesh.**
 - Participants were enrolled in 2000; followed up for an average of 6.6 years.
1. A **“balanced” pattern** comprised of steamed rice, red meat, fish, fruit and vegetables
 2. An **“animal protein” diet**, which was more heavily weighted towards eggs, milk, red meat, poultry, bread, and vegetables
 3. A **“gourd and root vegetable” diet** that heavily relied on a variety of gourds, radishes, pumpkin, sweet potato, and spinach.

Chen et al (2013)

- Significant **positive association** between the **animal protein dietary pattern** and risk of death from heart disease: HR 1.17 (0.99–1.38)
- The **positive association higher among ever smokers**: HR 1.20 (1.00–1.45).
- An **inverse association** was observed between the **balanced diet pattern** and **disease of the circulatory system but not with significance**;
- Adherence to **gourd and root vegetable diet pattern** was **not related** to risk of overall circulatory system disease, heart disease, or cerebrovascular disease.

Dietary patterns are associated with hyperhomocysteinemia in an urban Pakistani population.

Yakub M., Iqbal M.P. & Iqbal R. J Nutrition 140:1261–1266, 2010.

- **Hyperhomocysteinemia** has been reported to be quite prevalent among South Asians, especially in apparently healthy Pakistani individuals
- A cross-sectional study of 872 healthy adults (355 males, 517 females; aged 18–60 years) from an urban population in Karachi.

Yakub, Iqbal & Iqbal (2010)

1. The **prudent diet**: high intake of eggs, fish, raw vegetables, fruits, juices
 2. The **animal-protein diet**: high intake of meat, chicken, wheat, bananas, and tea with milk; meat usually cooked in hydrogenated oils
 3. The **plant-protein diet**: large intake of cooked vegetables and legumes and a small intake of meat.
- A **protective effect of the prudent and high plant protein dietary patterns** for the highest quartile of intake compared with the lowest quartile of hyperhomocysteinemia, OR = 0.52 (0.30–0.90); P = 0.01], and OR 0.42 (0.25-0.69) respectively.
 - The **animal-protein diet positively associated with hyperhomocysteinemia**, with the highest quartile of intake having the greatest increase in risk OR = 2.10 (1.22–3.60); P = 0.007].

Dietary Patterns and Health Outcomes

South East Asia: Thailand, Singapore

Dietary Pattern and Metabolic Syndrome in Thai Adults

Aekplakorn et al., J Nutr Metab 2015, doi.org/10.1155/2015/468759

- The **Thai National Health Examination Survey IV** (NHES IV), a nationally representative cross-sectional study conducted in 2009.
 - Included 5,872 adults (2,693 men and 3,179 women) aged 30–59 years
1. **“meat pattern”** : high intake of red meat, processed meat, and fried foods
 2. **“healthy pattern”** : high intake of beans, vegetables, wheat & dairy products
 3. **“high carbohydrate pattern”** : high intake of glutinous rice, fermented fish, “chili” paste and bamboo shoots

Aekplakorn et al (2015)

- The **meat pattern was associated with increased odds of abdominal obesity, high blood pressure, and hyperglycemia.**
- The **healthy pattern was associated with decreased odds of abdominal obesity and hypertriglyceridemia**
- Compared with the lowest quartile, the highest quartile of the **carbohydrate pattern was associated with MetS** : OR 1.82 (1.31, 2.55) in men and OR 1.60 (1.24, 2.08) in women

Beverage Habits and Mortality in Chinese Adults

Odegaard et al., J Nutr 145:595–604 2015

- **The Singapore Chinese Health Study** is a population-based, prospective investigation of diet and cancer risk.
- A total of 63,275 men and women aged 45-74 years provided data on diet, lifestyles, and medical histories through in-person interviews using a structured questionnaire at enrolment between 1993 and 1998.
- This article reported on 10,029 deaths followed from 1993-98 through 2011.

Odegaard et al., J Nutr 145:595–604 2015

- **Higher coffee and black tea intake** was inversely associated with mortality in never-smokers.
- **Light to moderate alcohol intake** was inversely associated with mortality regardless of smoking status
- **Heavy alcohol intake** was positively associated with mortality in smokers

Smoking creates dysfunction in cellular activity and a procarcinogenesis state, in which heavy alcohol consumption may exert a strong synergistic carcinogenic effect.

Adherence to a Vegetable-Fruit-Soy Dietary Pattern or the Alternative Healthy Eating Index Is Associated with Lower Hip Fracture Risk among Singapore Chinese

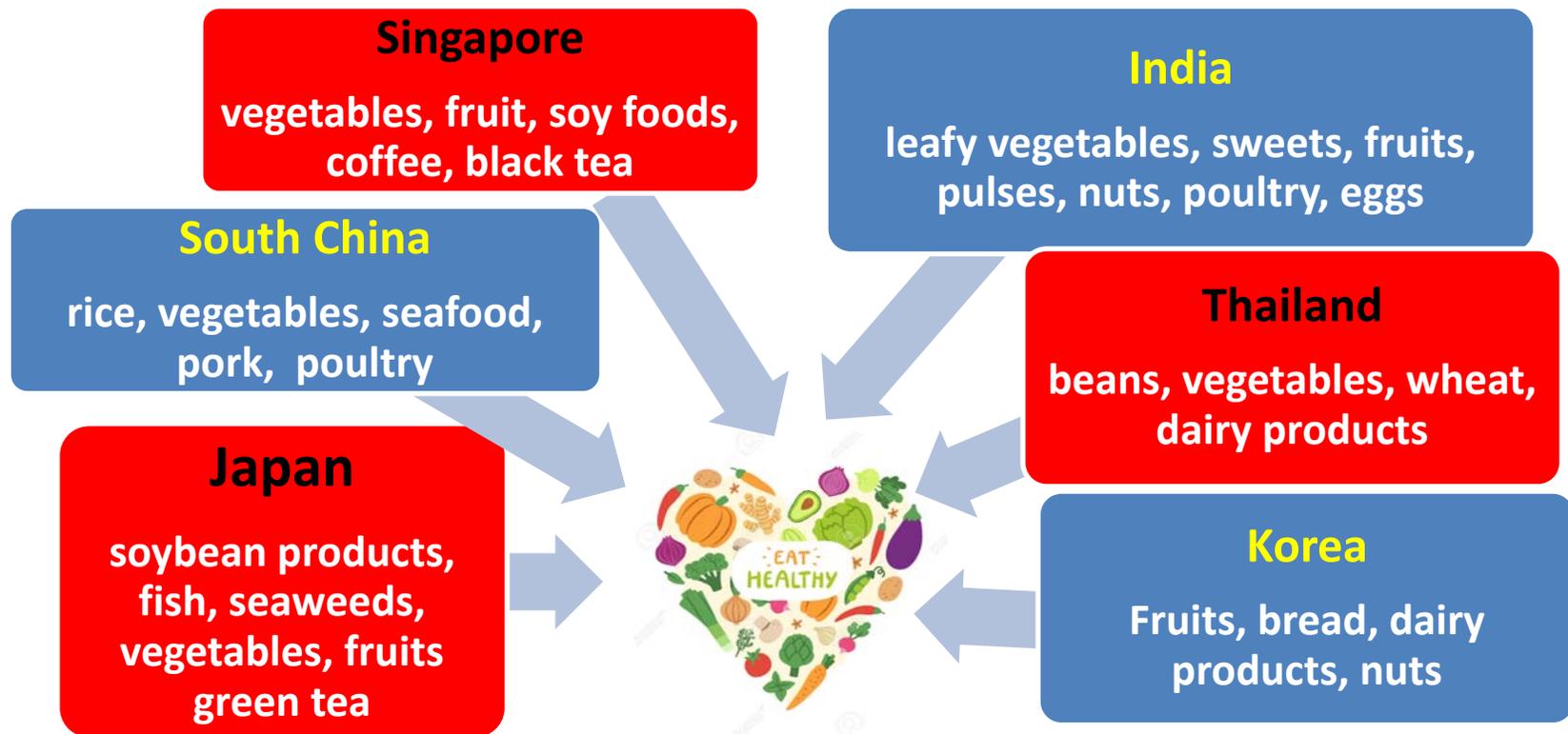
Dai et al., J Nutrition 144: 511–518, 2014.

- Based on the **Singapore Chinese Health Study**, higher scores for the **vegetable-fruit-soy pattern associated with lower risk of hip fracture** in a dose-dependent manner in both genders HR: 0.66 (0.55, 0.78)
- The “**meat-dim-sum**” pattern score was **not associated** with hip fracture risk.

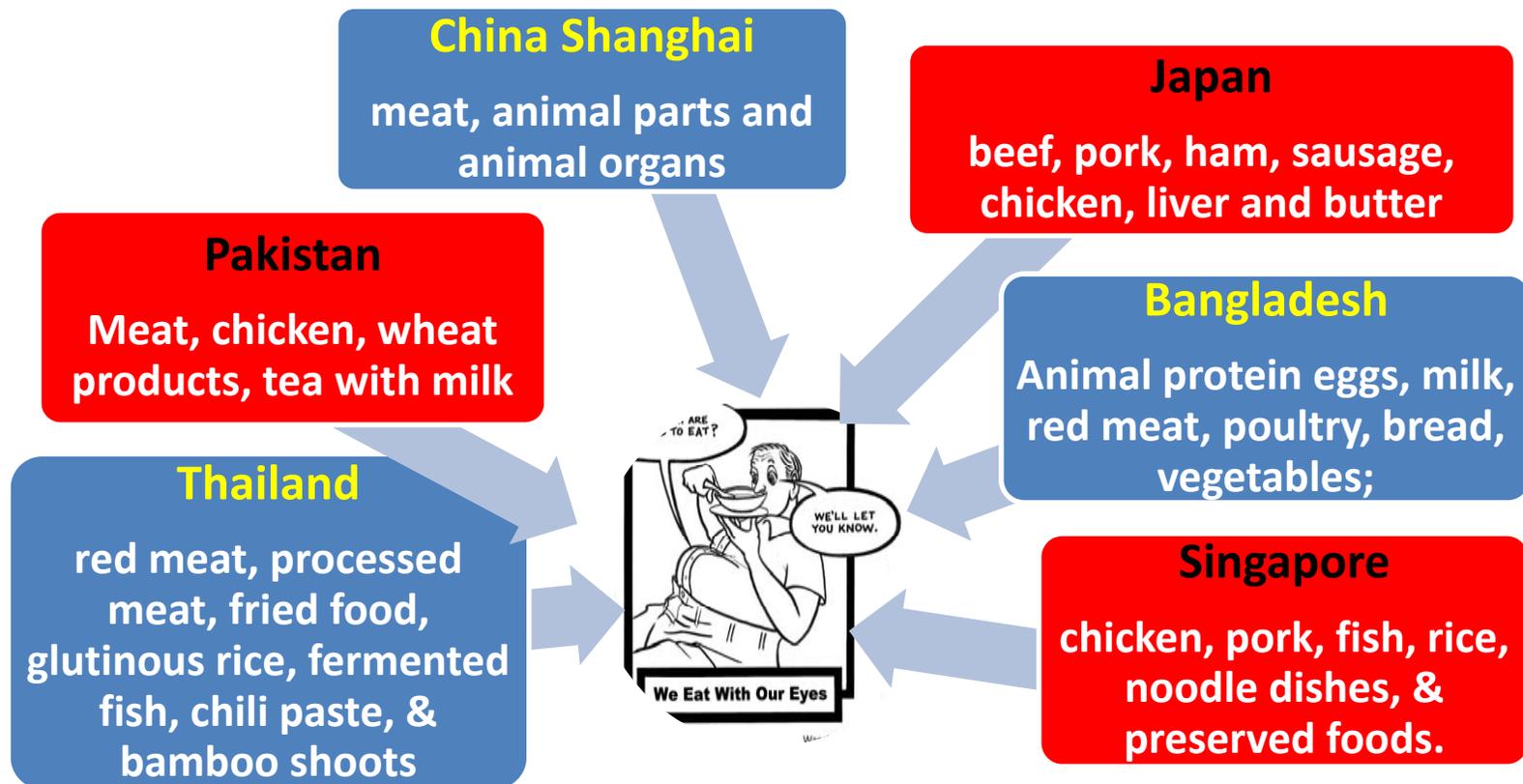


Concluding remarks

Food items in Asian dietary patterns associated with positive health outcomes



Food items in Asian dietary patterns associated with adverse health outcomes



Diet, Cardiovascular Disease, and the Food System: Recommendations for Global Food System Changes Needed to Create a Sustainable Healthy Diet
Anand SS et al J Am College Cardiology 66 :1590–1614, 2015

A Report From the Workshop Convened by the World Heart Federation

**Food Consumption and its Impact on Cardiovascular Disease:
Importance of Solutions Focused on the Globalized Food
System.**

Recommended Dietary Changes

Increase consumption

Low GI carbohydrates
Unsaturated plant oils, MUFAs, PUFAs,
Nuts, legumes , fruits, vegetables

Reduce consumption

Sugar-sweetened beverages
Trans fats; Saturated fats
Refined carbs, Sodium
Red meat, processed meats

Neutral

Eggs < 7/week, Fish

Minimal

Alcohol

Overall healthy diets to promote

DASH, Mediterranean Diet

Most sustainable diet

Plant-based

(Anand SS et al., 2015)

THANK YOU

