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International Congress of Nutrition

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Methods to collect and compare data across geography

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University of São Paulo
School of Public Health

Session: "Understanding Dietary Patterns: A Step toward Devising a Global Nutrition Strategy"

Conflict of Interest Disclosure

I have no conflict of interest to report in relation to this presentation.

Insights on "diet"

"**Diets** are complex exposures with innumerable and sometimes poorly characterized components that are consumed in varying amounts and combinations."

***Dietary variables**:* the entire population is "exposed" to some degree.

Diet is *dependent of* exposure time, of individual dietary habits and food composition.

Satija A. *Adv Nutr* 2015

Systematization of dietary intake data

First dietary assessments

1947

HARVARD SCHOOL OF PUBLIC HEALTH
SPECIAL PRENATAL STUDY
221 LONGWOOD AVENUE, BOSTON, MASSACHUSETTS

One Complete Day's Record of Food Eaten

Directions:

Orange juice or *fruit:* State number of oranges and size used.

Other fruit: State kind, number or size of serving (1 small sauce dish = ½ measuring cup, 4 rounding tbsps.* = ½ cup, 16 level tbsps. = 1 cup).

Cereal: State amount as rounding tbsps. or in terms of measuring cup.

Bread: State number of slices, and if purchased as sliced bread. If not, state thickness as ¼ or ½ inch or whatever it is.

Butter: Record as level tsps. (1 pat = 1 level tsp.†).

Egg: Check as to whether whole egg or yolk only.

Bacon: Number of slices—indicate whether long (full length) slices or ½ slices.

Milk: Amount on cereal—state in terms of measuring cup. If top milk or cream used, cross out milk. State cream light, medium, or heavy. Cup refers to measuring cup. *1 ordinary drinking glass = ¾ cup.* 1 tall glass (iced tea glass) = 1¼ cup. Where it states milk or cream, cross out one not used.

Sugar: Give as level tsps.

Other foods: Record as accurately as possible in ordinary household measures any foods eaten not listed.

Meat or Fish:
1 small serving meat or fish = 1 oz. = 2 tbsps.
1 average serving meat or fish = 3 oz.
1 large serving meat or fish = 4 oz.

Vegetables: Record in rounding tbsps.
(1 ordinary small saucer of vegetables = ½ cup = 4 rounding tbsps.)

Dessert:
Average serving = ½ cup.
Milk or sauce, etc., added should be recorded and amount stated.

* Tablespoon = tbsp. † Teaspoon = tsp.

Name ..... Date .....

Address .....

Read directions carefully before filling out the following:

Breakfast: Time ..... a. m.

Orange ..... Amount. Other fruit ..... Amount .....

Cereal — Kind ..... Amount .....

Bread — Kind ..... { No. slices ..... / Thickness ..... inch } Toasted { Yes / No }

Butter — Amount ..... tsps.

Egg ..... No. whole egg or yolk. How cooked .....

Bacon ..... No. of slices. Sugar on cereal ..... tsps.

Milk ..... Amount on cereal. Milk to drink ..... cups

Cocoa ..... cups. Other beverage ..... cups

Is cocoa made with milk? ..... If not, what part milk? .....

Sugar in cocoa or other beverage ..... tsps.

Milk or cream added to cocoa or other beverage ..... tbsps.

Other foods eaten ..... Amounts .....

..... Amounts .....

Between Breakfast and Noon Meal: Time ..... a. m.

Foods eaten ..... Amounts .....

..... Amounts .....

(Include ice cream, candy, sodas, etc.)

FIG. 3. *First and second pages of four-page form which is filled out by the subject on three consecutive days.*

Burke. *J Am Diet Assoc* 1947

Systematization of data

- First dietary assessments

1930's

1986 - 1996

- Biomarkers of dietary intake, validation of technics

Validation of weighed records and other methods of dietary assessment using the 24 h urine nitrogen technique and other biological markers

BY S. A. BINGHAM[1], A. CASSIDY[1], T. J. COLE[2], A. WELCH[1], S. A. RUNSWICK[1], A. E. BLACK[1], D. THURNHAM[3], C. BATES[2], K. T. KHAW[4], T. J. A. KEY[5], AND N. E. DAY[6]

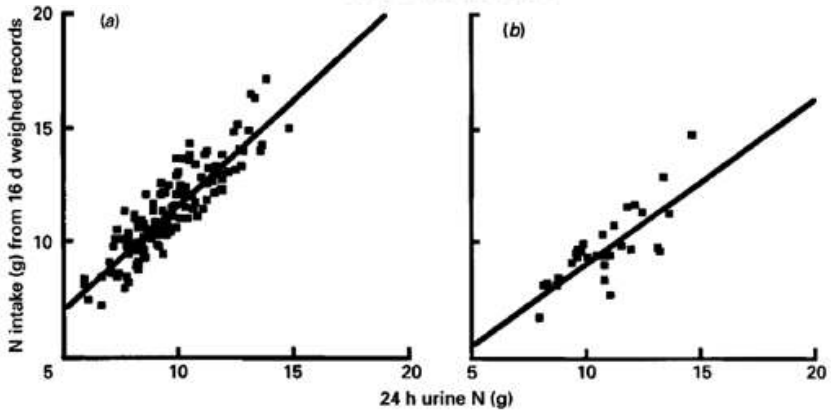


Fig. 3. The relationship between 24 h urine nitrogen and dietary nitrogen from 16 d weighed records in individuals from (*a*) the lower four quintiles and (*b*) the top quintile of the urinary nitrogen : dietary nitrogen ratio distribution. For details of subjects and procedures, see pp. 532–534.

Bingham SA. *Br J Nutr* 1995

Systematization of data

1930's

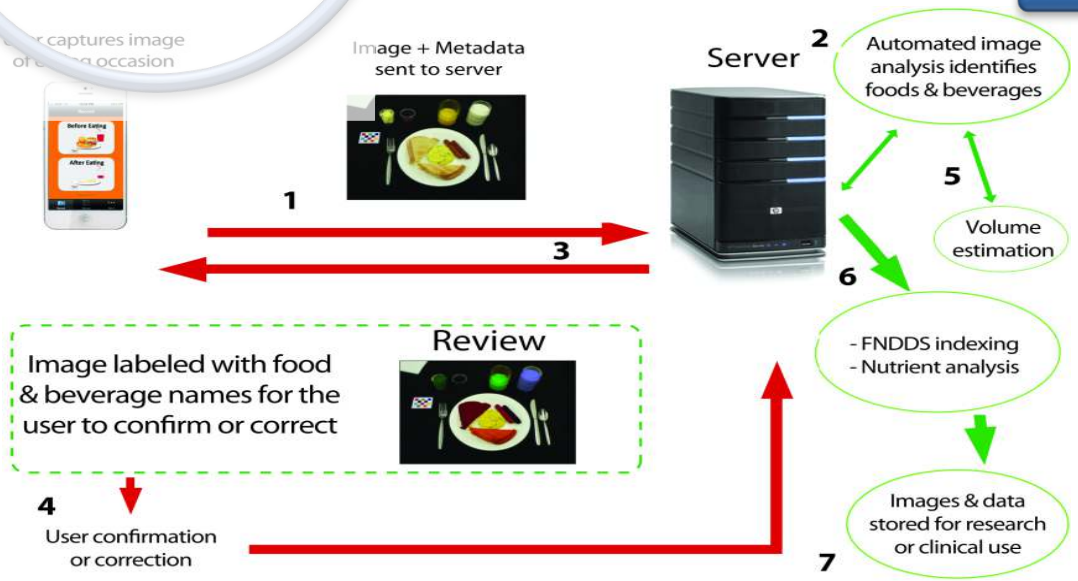
- First dietary assessments

1986 - 1996

- Biomarkers of dietary intake, validation of technics

1990 - nowadays

- New technologies for data collection and analysis

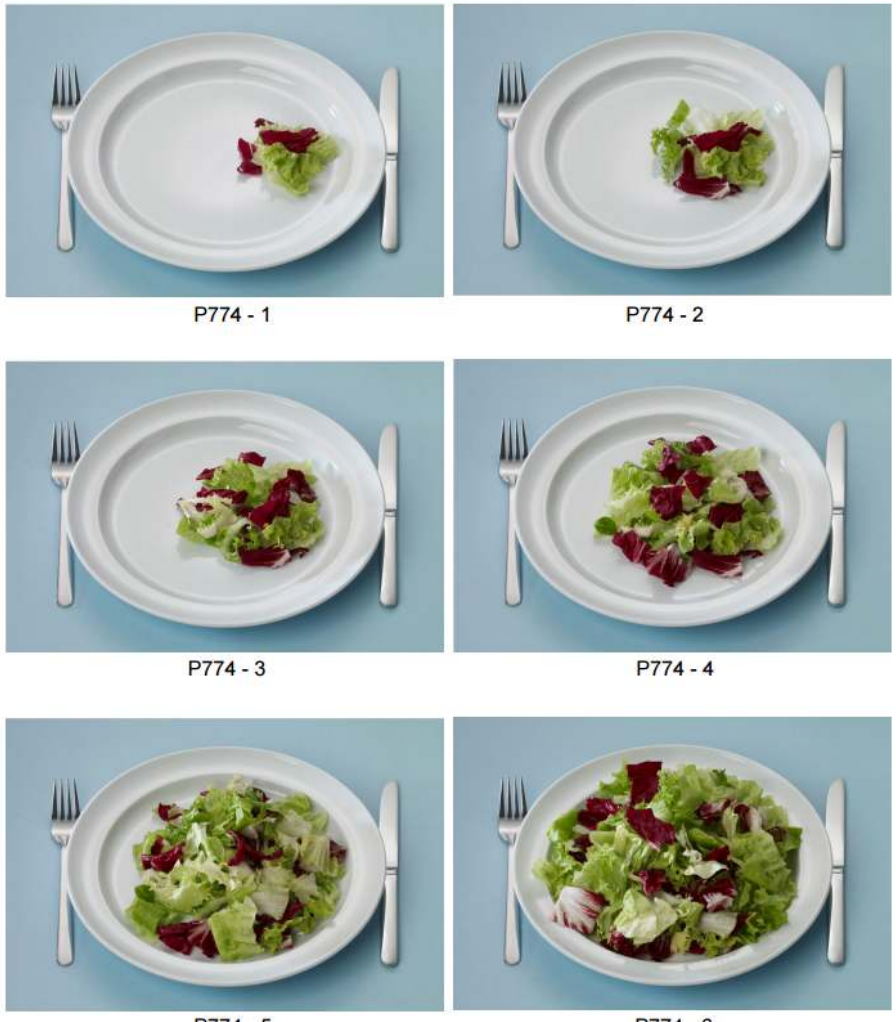


Technology Assisted Dietary Assessment (TADA)
Mobile Food Record (mFR) - **2015**

***JMIR mHealth uHealth* 2015**

Systematization of data

P774 **Salada de folhas de verduras** **Mixed green salads**

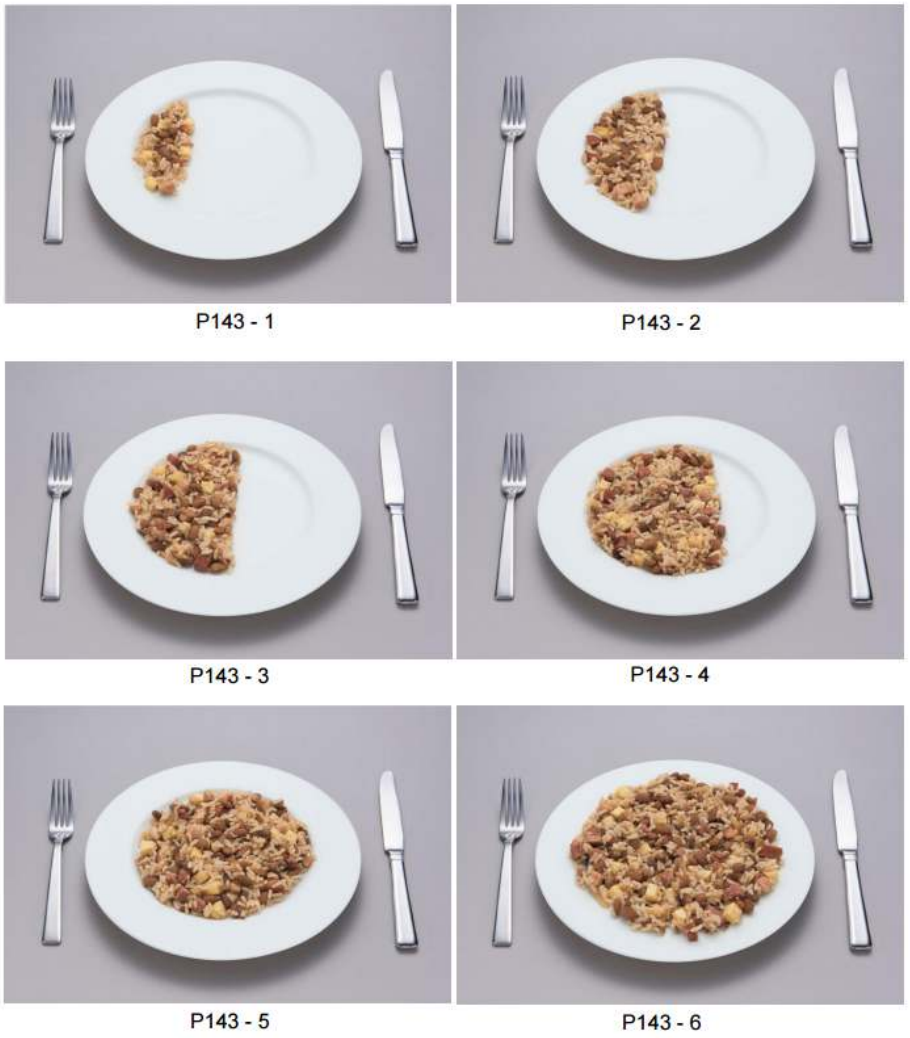


P774 - 1 P774 - 2

P774 - 3 P774 - 4

P774 - 5 P774 - 6

P143 **Baião de dois** **Mixed rice and beans**



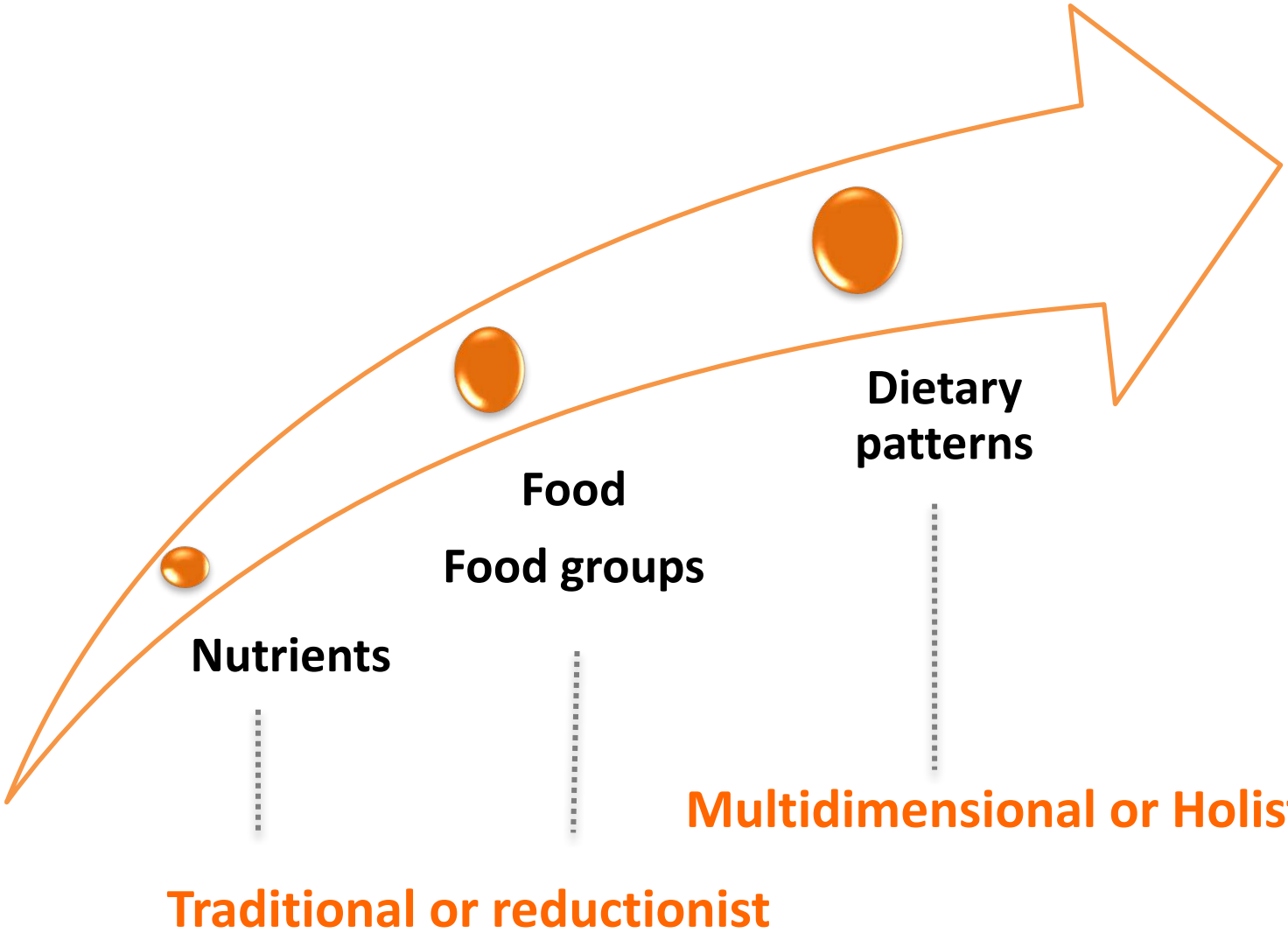
P143 - 1 P143 - 2

P143 - 3 P143 - 4

P143 - 5 P143 - 6

Crispim SP, Fisberg RM. *Manual Fotográfico de Quantificação Alimentar* 2016

Approaches in dietary research



Approaches in dietary research

- Dietary patterns
- Foods or food groups

Health Survey of São Paulo - ISA

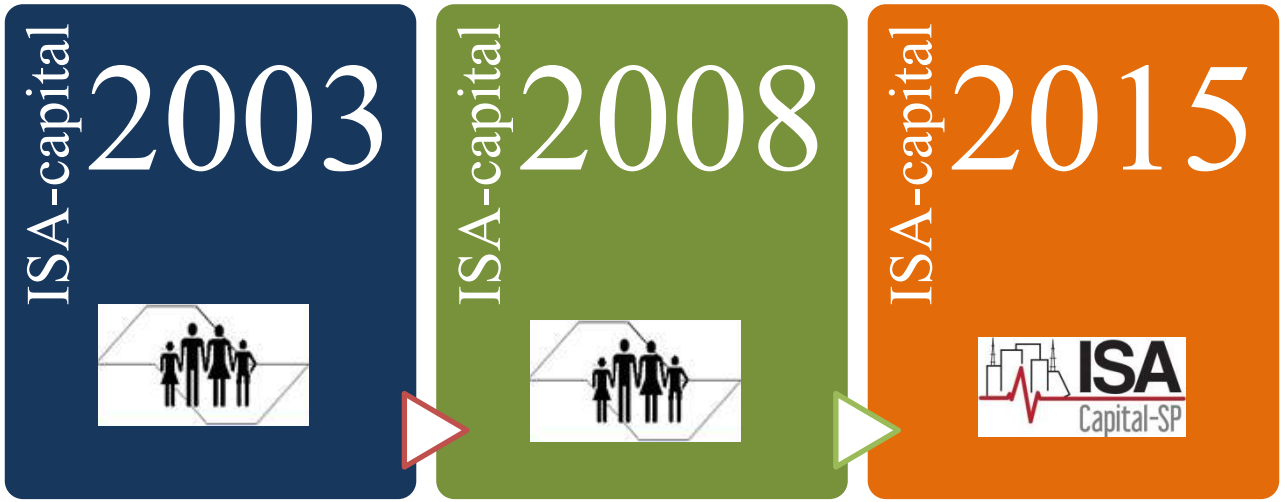
Cross-sectional study

Population based

Cluster sampling

Census tracts and households

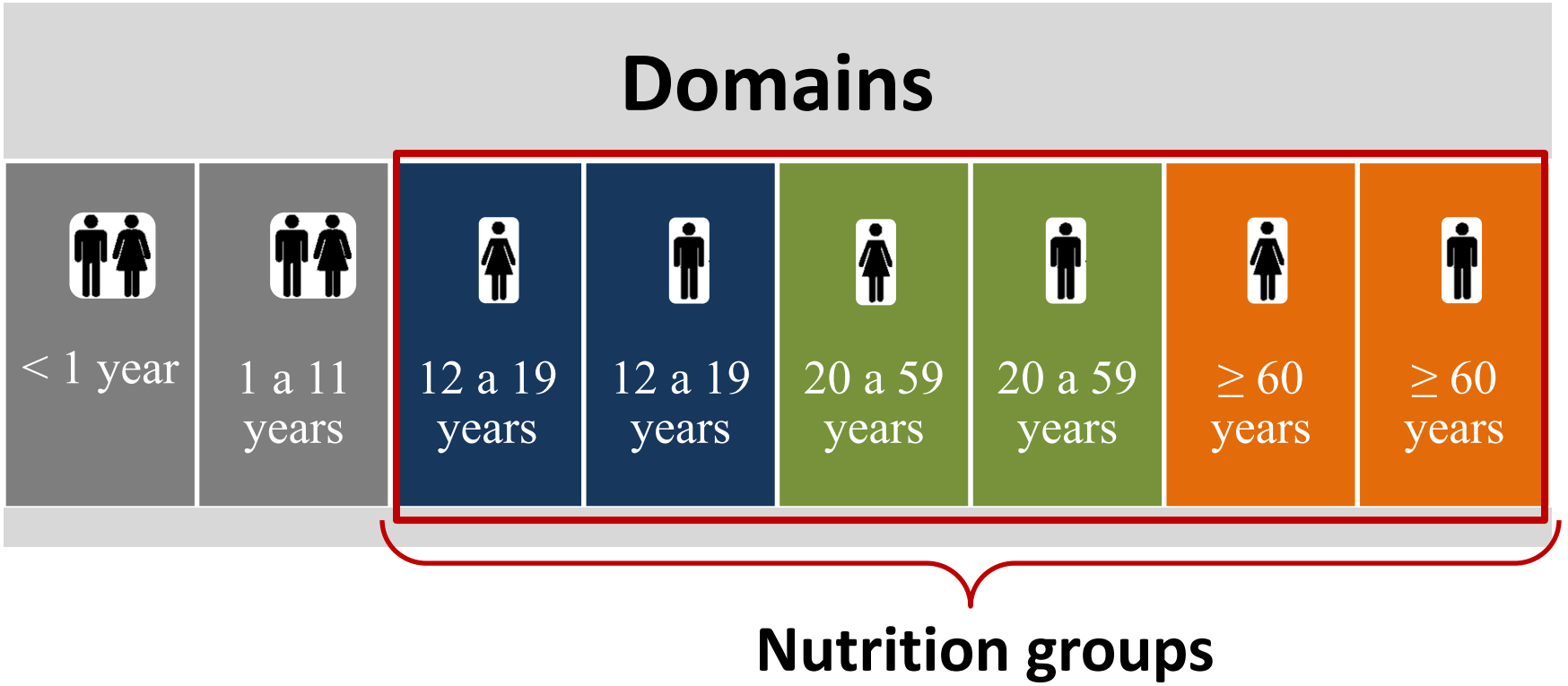
ISA-Nutrition



Living conditions | **Lifestyle** | **Health status** | **Use of health services**

Nutrition

Demographic stratification in ISA-Capital



Flow of data collection

Structured questionnaire

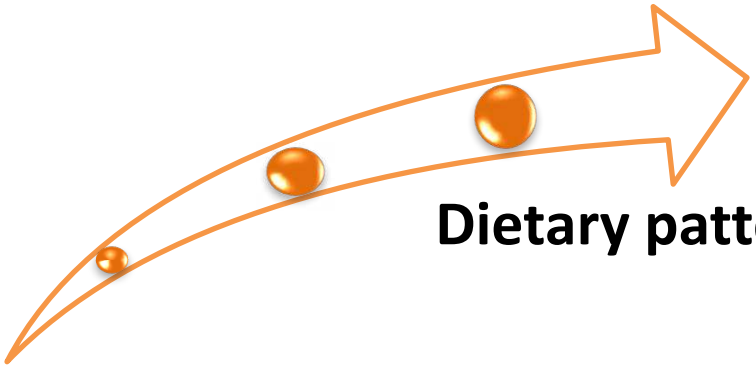
24-hour dietary recall

Blood pressure, anthropometric and biochemical assessment

Nutrition research

DIETARY PATTERNS - MONITORING

Dietary patterns – Analysis



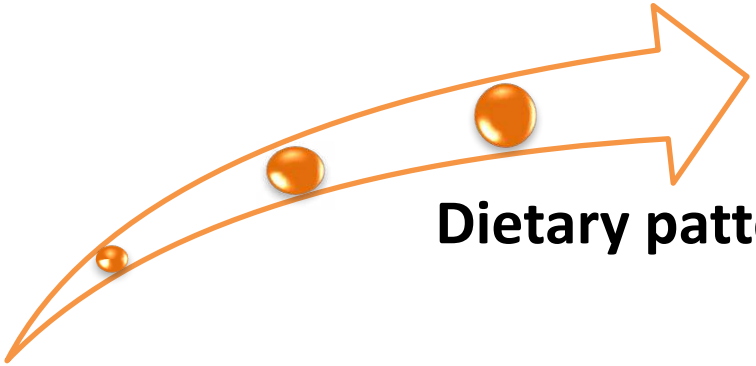
Dietary patterns

Theoretically derived methods →  ***Hypotheses-driven***

Empirically derived methods →  ***Data-driven***

Ocké MC. *Proc Nutr Soc* 2013

Dietary patterns – Analysis



Dietary patterns

Theoretically derived methods

Hypotheses-driven

Dietary quality scores

Healthy Eating Index 2010

Revised Brazilian Healthy Eating Index (BHEI-R)

Ocké MC. *Proc Nutr Soc* 2013

Brazilian Healthy Eating Index in São Paulo

Preventive Medicine Reports 4 (2016) 391–396

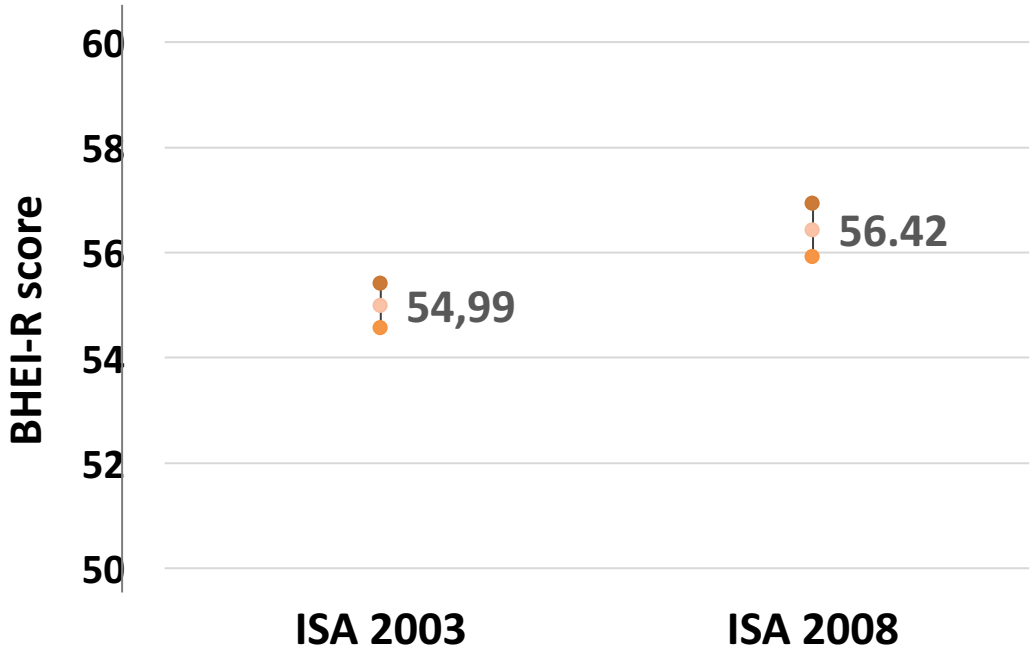
Contents lists available at ScienceDirect

Preventive Medicine Reports

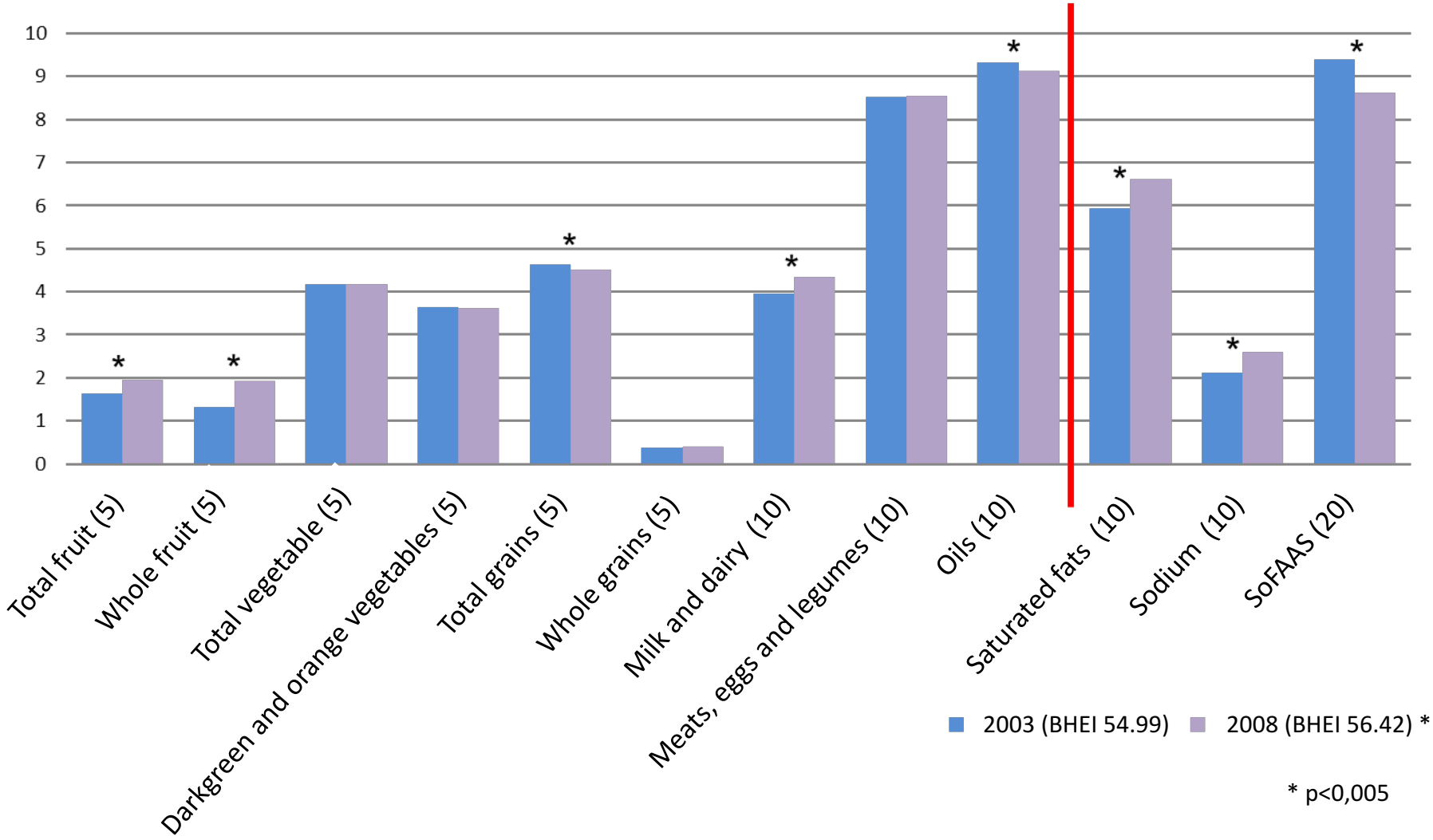
journal homepage: http://ees.elsevier.com/pmedr

Trends in diet quality among adolescents, adults and older adults: A population-based study☆,☆☆,★

Samantha Caesar de Andrade PhD [a,*,1], Ágatha Nogueira Previdelli PhD [a,2], Chester Luiz Galvão Cesar PhD [b,3], Dirce Maria Lobo Marchioni PhD [a,4], Regina Mara Fisberg PhD [a,5]



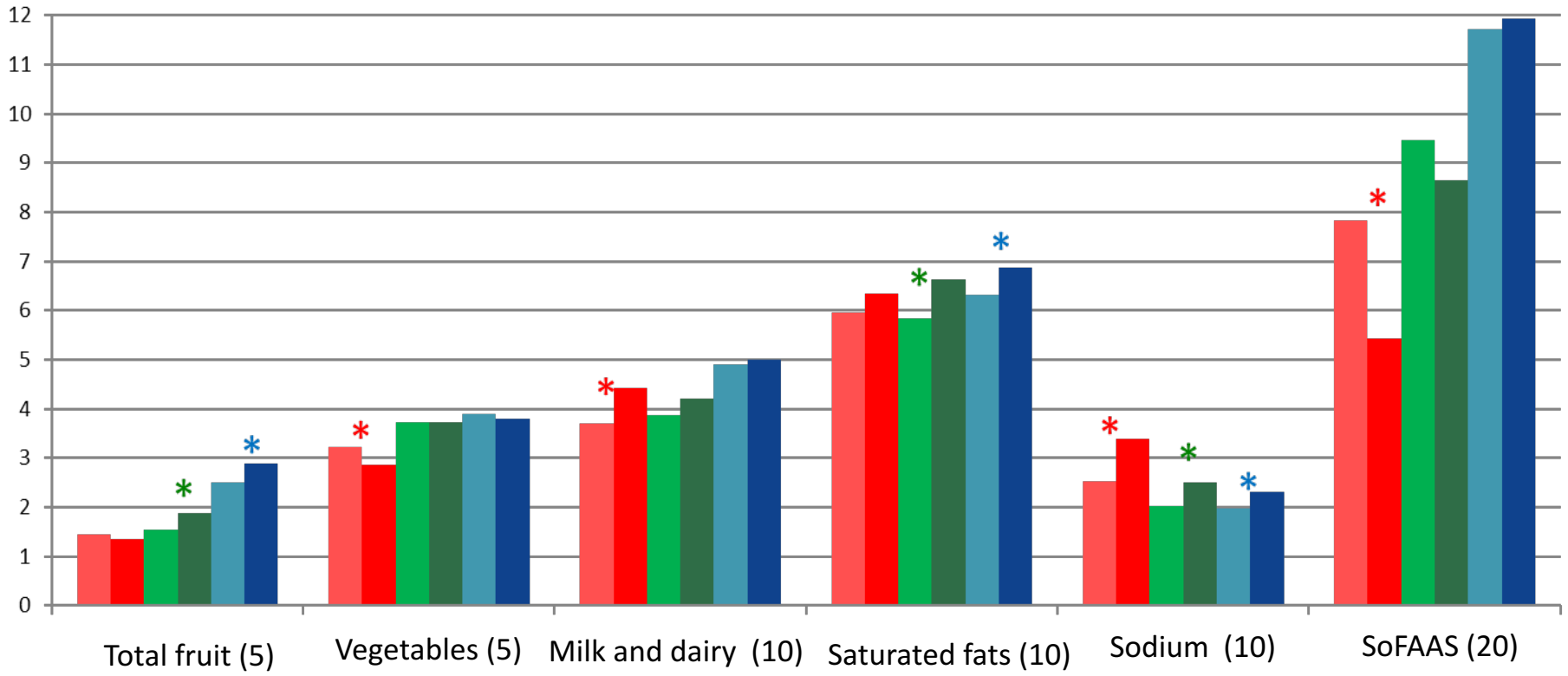
Comparison of means of BHEI-R components of the population of São Paulo in 2003 and 2008. ISA-Capital



Oils = Vegetable oils, seed oils and oily fish
SoFAAS = total calories from solid fat, alcohol and added sugar

Andrade SC, Fisberg RM. *Prev Med* 2016

Comparison of means of BHEI-R components and final score according to age group of residents in São Paulo in 2003 and 2008. ISA-Capital



* p<0,005

Andrade SC, Fisberg RM. *Prev Med* 2016

Factors associated with BHEI-R identified by multiple regression analysis for participants of ISA-Capital 2003 and 2008

Independent variable		2003		2008	
		β	p	β	p
Energy intake (Kcal)		-0.0021	<0.001	-0.0013	0.002
Age group	Adults[a]	2.4469	<0.001	6.1154	<0.001
	Older adults[a]	7.1968	<0.001	10.7202	<0.001
Smoking habits	Former smoker[b]	-2.9523	<0.001	-3.0910	0.003
Head of household education (years)		-0.0664	0.032	-0.1550	0.155

[a] In relation to adolescents.

[b] In relation to never smoked.

2003
Adults ↑ 2.4 points
Older adults ↑ 7.2 points

2008
Adults ↑ 6.1 points
Older Adults ↑ 10.7 points

Andrade SC, Fisberg RM. *Prev Med* 2016

Global dietary quality scores

	Score based on greater consumption of ten healthy dietary items	Score based on lesser consumption of seven unhealthy dietary items	Score based on 17 dietary items
Global	44·0 (10·5)	52·1 (18·6)	51·9 (9·3)
Sex			
Men	42·4 (10·5)	50·6 (18·8)	50·3 (9·4)
Women	46·0 (10·6)	53·8 (18·5)	53·7 (9·3)
p value*	<0·0001	<0·0001	<0·0001
Age, years			
20–29	36·0 (10·0)	45·8 (18·5)	44·0 (9·4)
30–39	39·4 (10·3)	46·3 (18·6)	46·5 (9·6)
40–49	42·2 (10·7)	47·9 (18·7)	49·0 (9·7)
50–59	44·4 (10·7)	50·4 (18·4)	51·5 (9·4)
60–69	45·9 (10·7)	53·2 (18·1)	53·6 (9·0)
70–79	45·6 (10·8)	54·0 (18·0)	53·7 (8·9)
≥80	44·7 (10·7)	54·2 (18·0)	53·2 (8·9)
p value for trend*	<0·0001	<0·0001	<0·0001
Country income level			
High (n=47)	47·0 (9·3)	37·4 (11·2)	48·6 (8·1)
Upper middle (n=53)	45·2 (11·3)	46·2 (12·8)	50·1 (8·7)
Lower middle (n=51)	40·9 (10·9)	55·0 (15·3)	51·1 (9·4)
Low (n=36)	42·9 (9·6)	75·9 (12·5)	59·9 (7·3)
p value for trend*	0·0005	<0·0001	0·0006

Data are mean (SD). Possible range of each score is from 0 (less healthy) to 100 (more healthy). *p values for differences by sex or across ordinal categories of age or country income were estimated using hierarchical regression analysis accounting for age–sex distribution. Age, sex, and country income (high, ≥US$12 475; upper middle, US$4037–12 474; lower middle, US$1025–4036; low, <US$1024) were mutually adjusted when assessing statistical significance of each.

Table 2: Global dietary patterns among men and women in 187 countries in 2010

Women

Older adults

Lower income

Imamura F., NUTRICoDE. *The Lancet* 2015

Global dietary pattern

Dietary pattern based on more healthy items

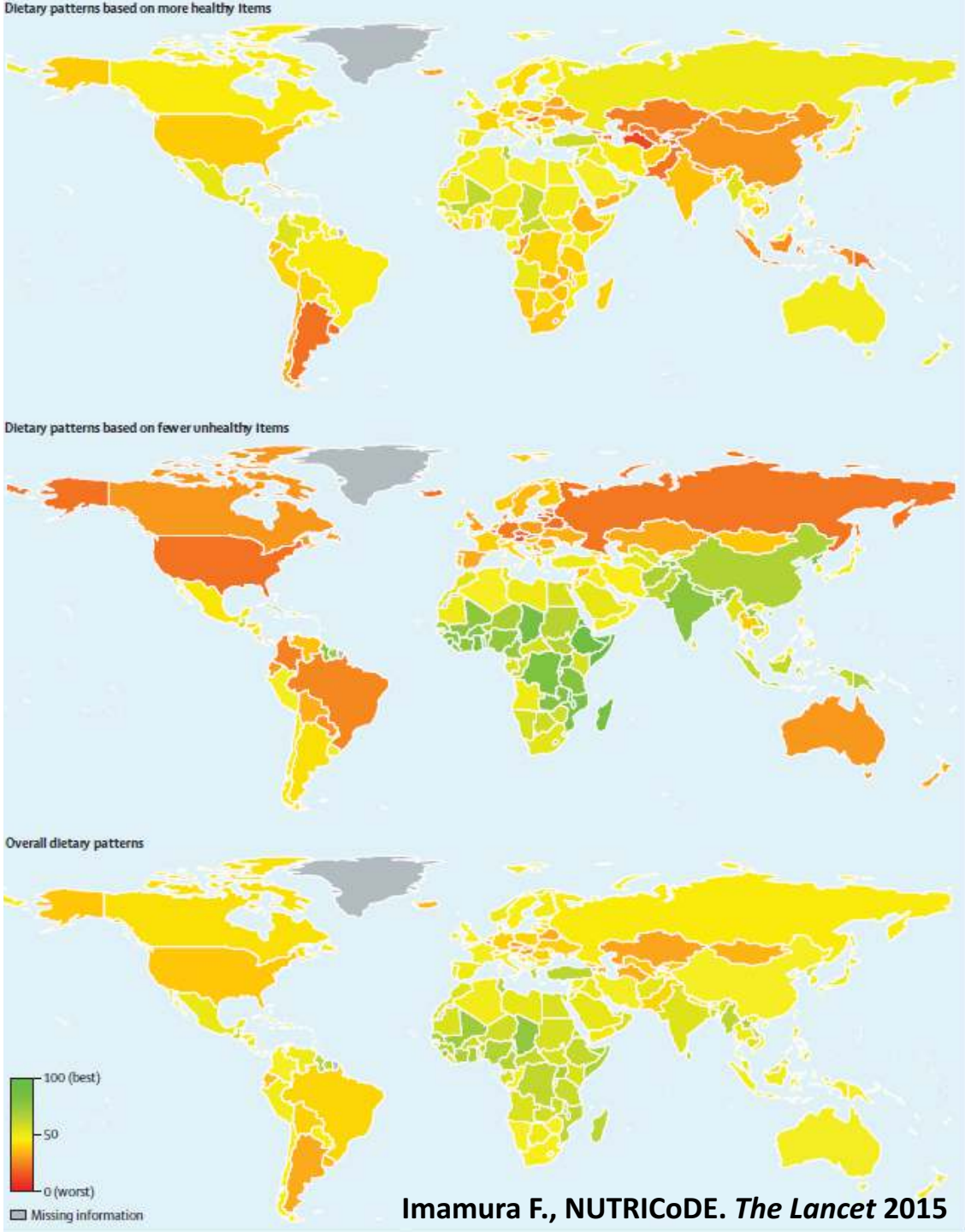
Whole grains, Fruit , Vegetables, Fish, Nuts and seeds, Beans, Milk, Dietary fiber, Polyunsaturated fat, Omega-3 fat

Dietary patterns based on fewer unhealthy items

Sugar-sweetened beverages, Processed meats, Unprocessed red meats, Saturated and Trans fat, Cholesterol and Sodium

Overall dietary patterns

Values represent degrees of adherence to each dietary pattern, ranging from 0 (least healthy) to 100 (most healthy)

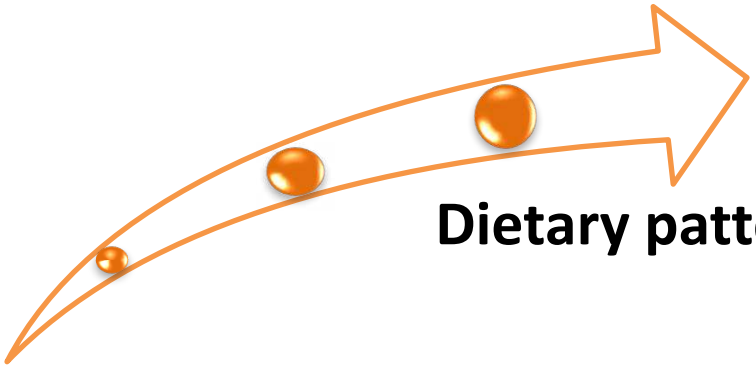


Imamura F., NUTRICoDE. *The Lancet* 2015

Nutrition Research

DIETARY PATTERNS - OUTCOMES

Dietary patterns – Analysis



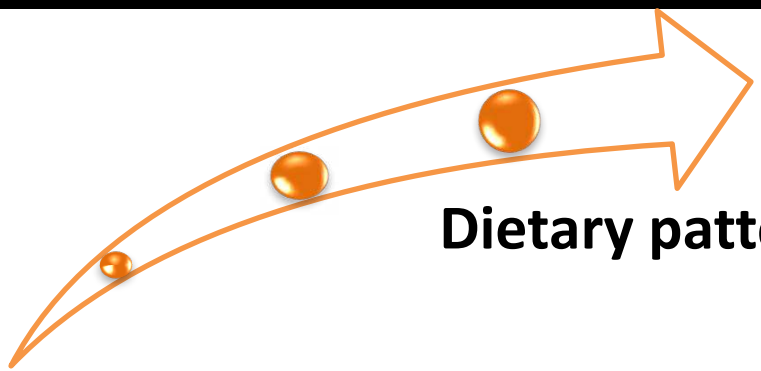
Dietary patterns

Theoretically derived methods →  ***Hypotheses-driven***

Empirically derived methods →  ***Data-driven***

Ocké MC. *Proc Nutr Soc* 2013

Dietary patterns – Analysis



Dietary patterns

Empirically derived methods

Data-driven

Multivariate analysis techniques

- Principal Component Analysis (PCA)
- Exploratory Factor Analysis (EFA)
- Structural Equation Modeling (SEM)
- Cluster Analysis (CA)
- Treelet Transform (TT)

Ocké MC. *Proc Nutr Soc* 2013

Examining associations between dietary patterns and metabolic CVD risk factors: a novel use of structural equation modelling

Michelle Alessandra Castro[1]*, Valéria Troncoso Baltar[2], Dirce Maria Marchioni[1] and Regina Mara Fisberg[1]

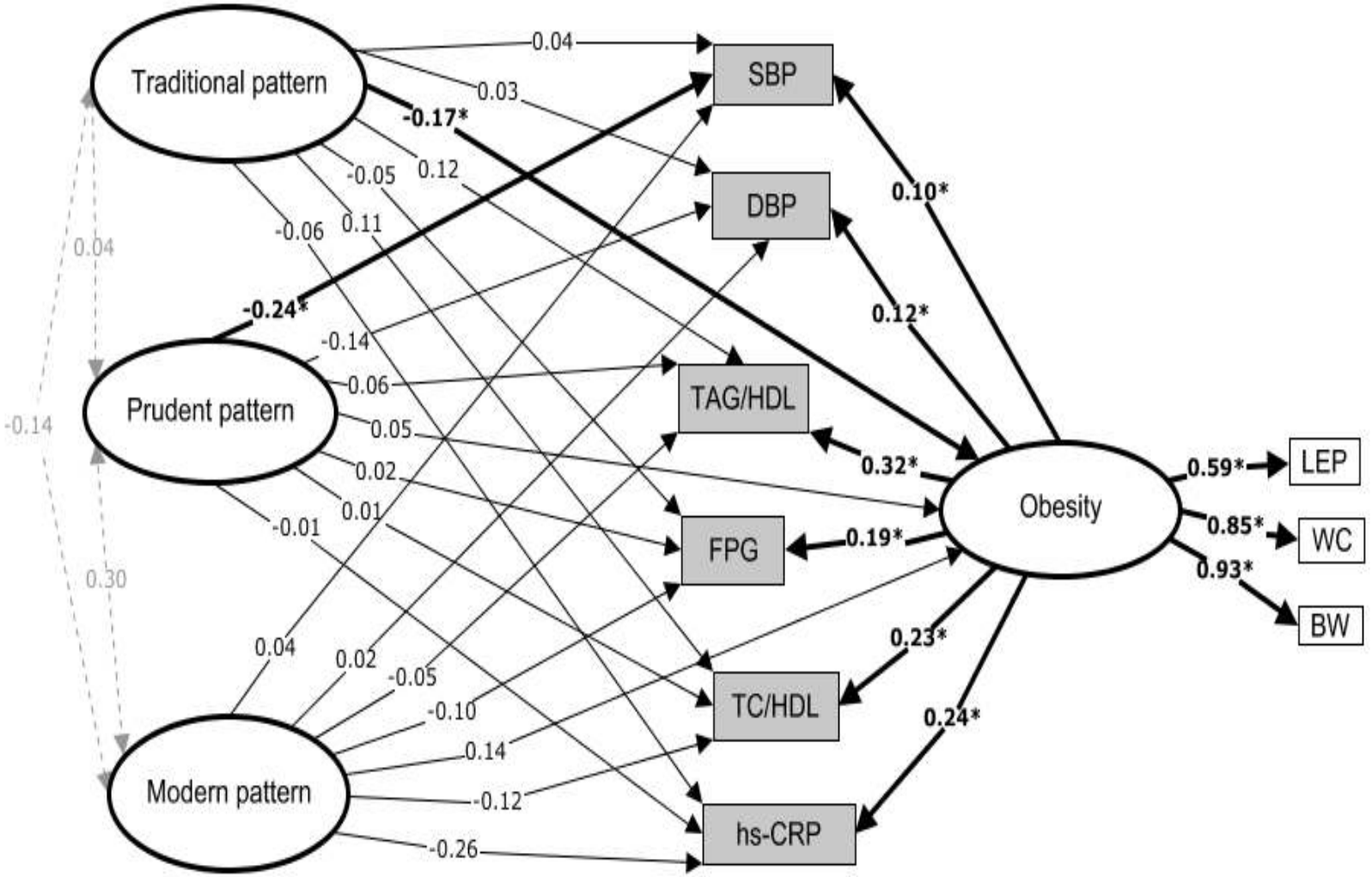


Fig. 2. Structural equation model diagram with standardised estimates for the relationship between dietary patterns and metabolic CVD risk factors, Health Survey of São Paulo, Brazil, 2008–2011. * Standardised coefficients significant at the critical value of 0·05. SBP, systolic blood pressure; DBP, diastolic blood pressure; FPG, fasting plasma glucose; hs-CRP, high-sensitivity C-reactive protein; LEP, leptin; WC, waist circumference; BW, body weight.

de Castro MA, Fisberg RM. *Br J Nutr* 2016

Dietary pattern and metabolic CVD risk in São Paulo

Indirect effects of Traditional pattern

Beans (0.84)

Rice (0.74)

Red Meats (0,20)

Butter margarine (0.14)

Whole milk (0.13)

White sugar (0.17)

Milk lf/s (-0.17)

Cheese (0.17)

Alc beverg (-0.17)

Sandw/ baked goods (-0.17)

Whole bread (-0.14)

Pasta (-0.14)

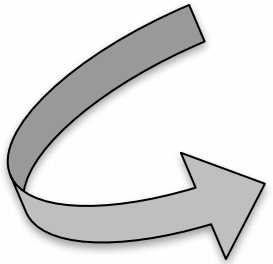
Eggs (0.17)

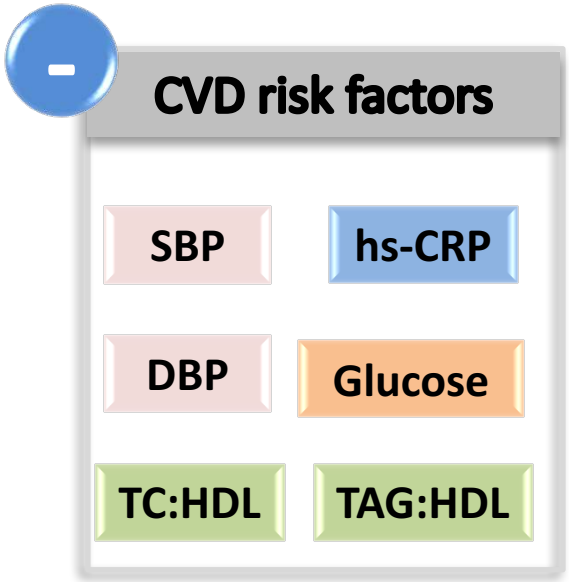
Sweets (-0.13)

Cold cuts (-0.12)

Mayo (-0.12)

Legum (-0.11)





Protective role against weight gain and cardiometabolic risk factors

de Castro MA, Fisberg RM. *Br J Nutr* 2016

Dietary pattern and metabolic CVD risk in São Paulo

Potential cardioprotective effect

Vegetables (0.61)	Seasonings (0.42)	Whole bread (0.18)	Low-fat and skimmed milk (0.18)
		Juices (0.14)	Fish and poultry (0.14)
Olive oil (0.54)	Fruits (0.32)	Soda pop (-0.25)	Cookies (-0.27)

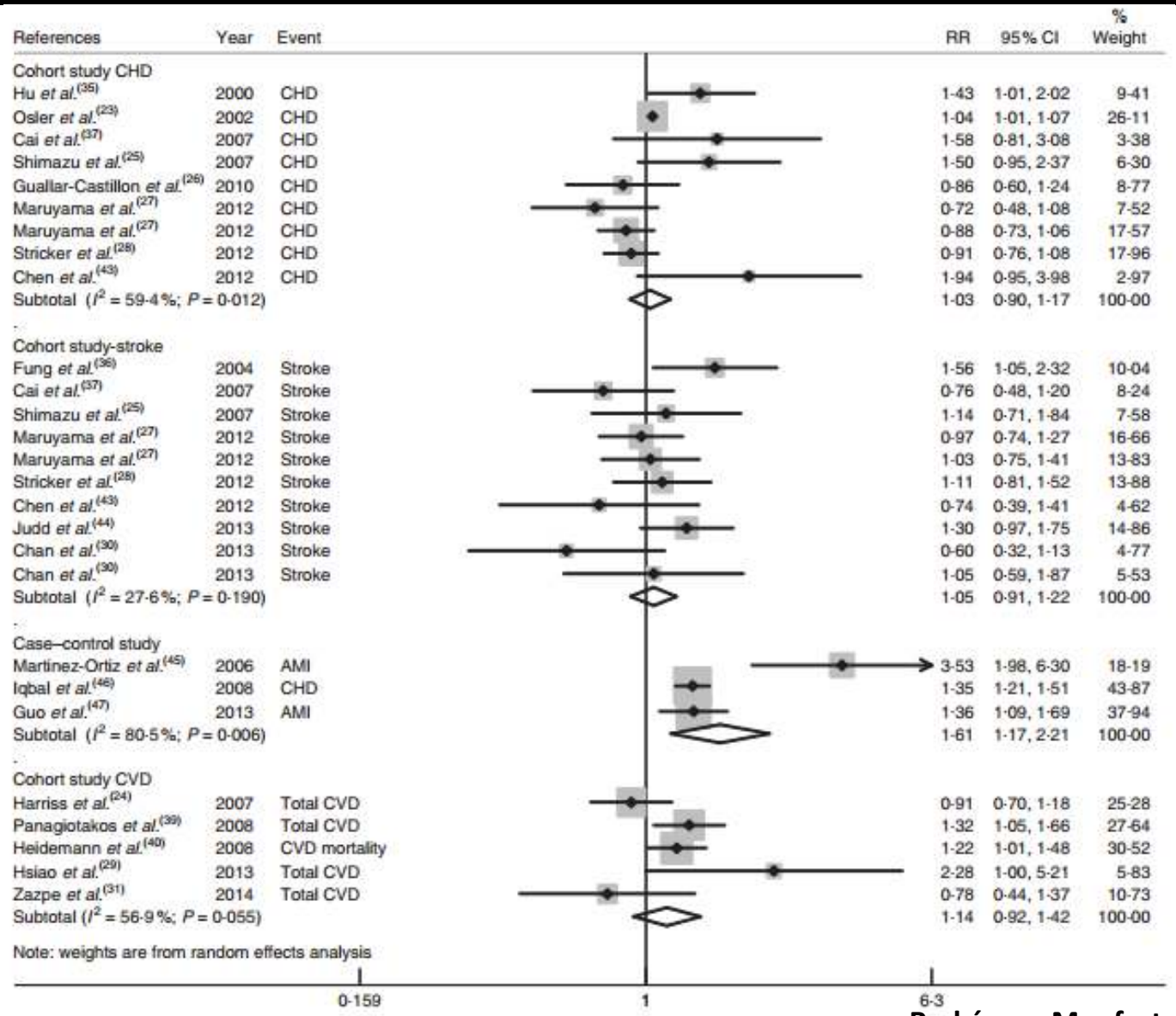
Synergistic effect

- **Nutrients** (K, Ca, vit C, vit D, carotenoids, fiber, CLA, oleic acid)
- **Phytochemicals** (phenolic compounds and flavonoids)

de Castro MA, Fisberg RM. *Br J Nutr* 2016

Global dietary patterns and CVD

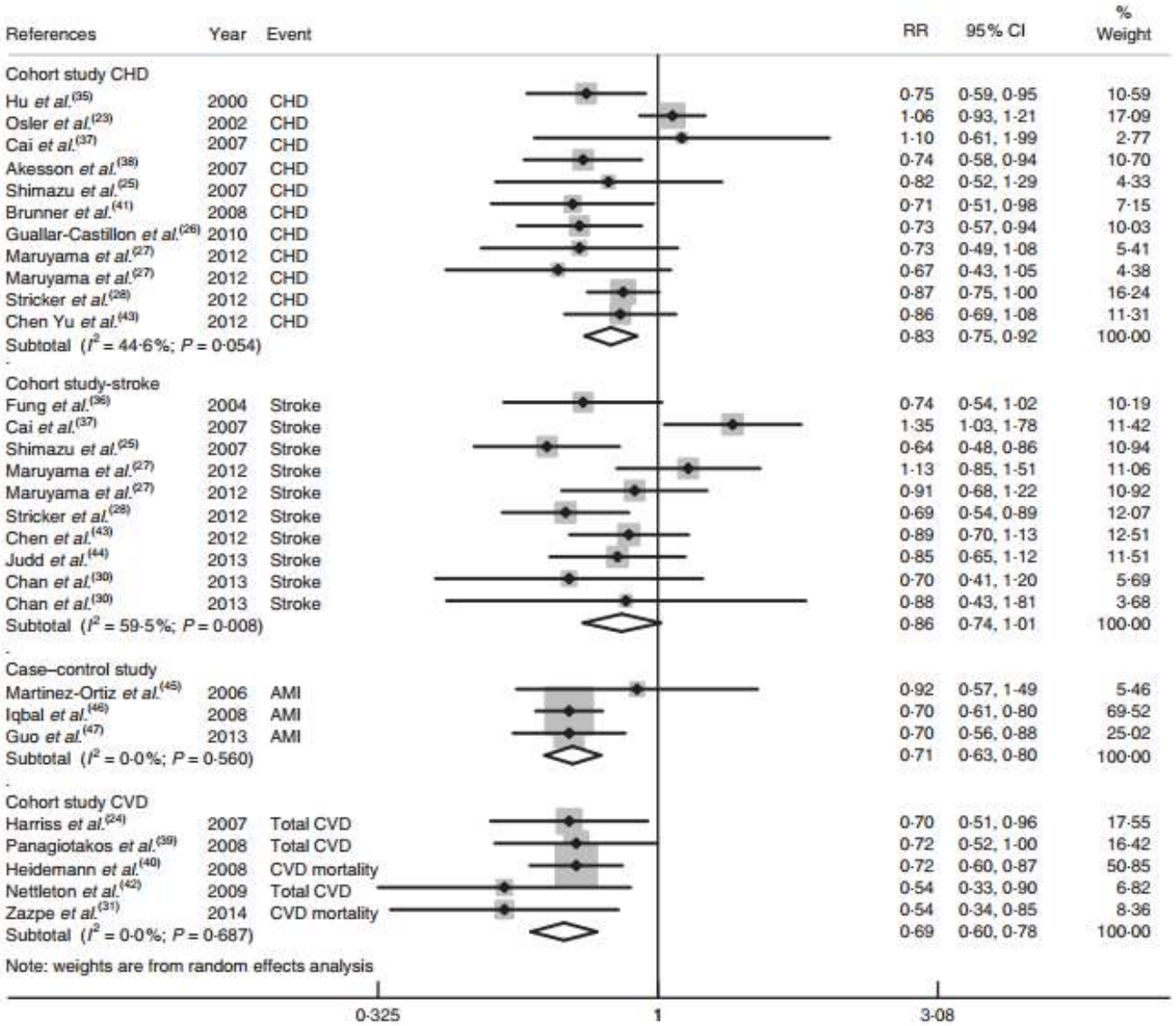
Western/unhealthy dietary pattern



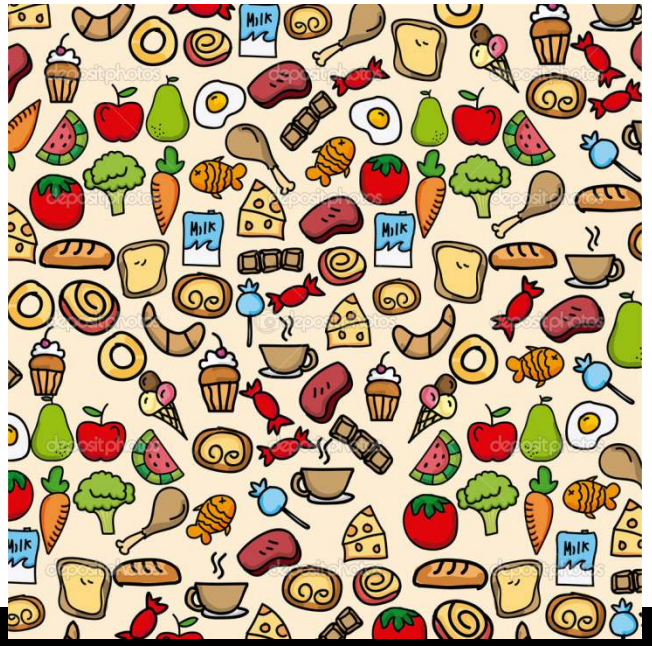
Rodríguez-Monforte M. *Br J Nutr* 2015

Global dietary patterns and CVD

Prudent/healthy dietary pattern



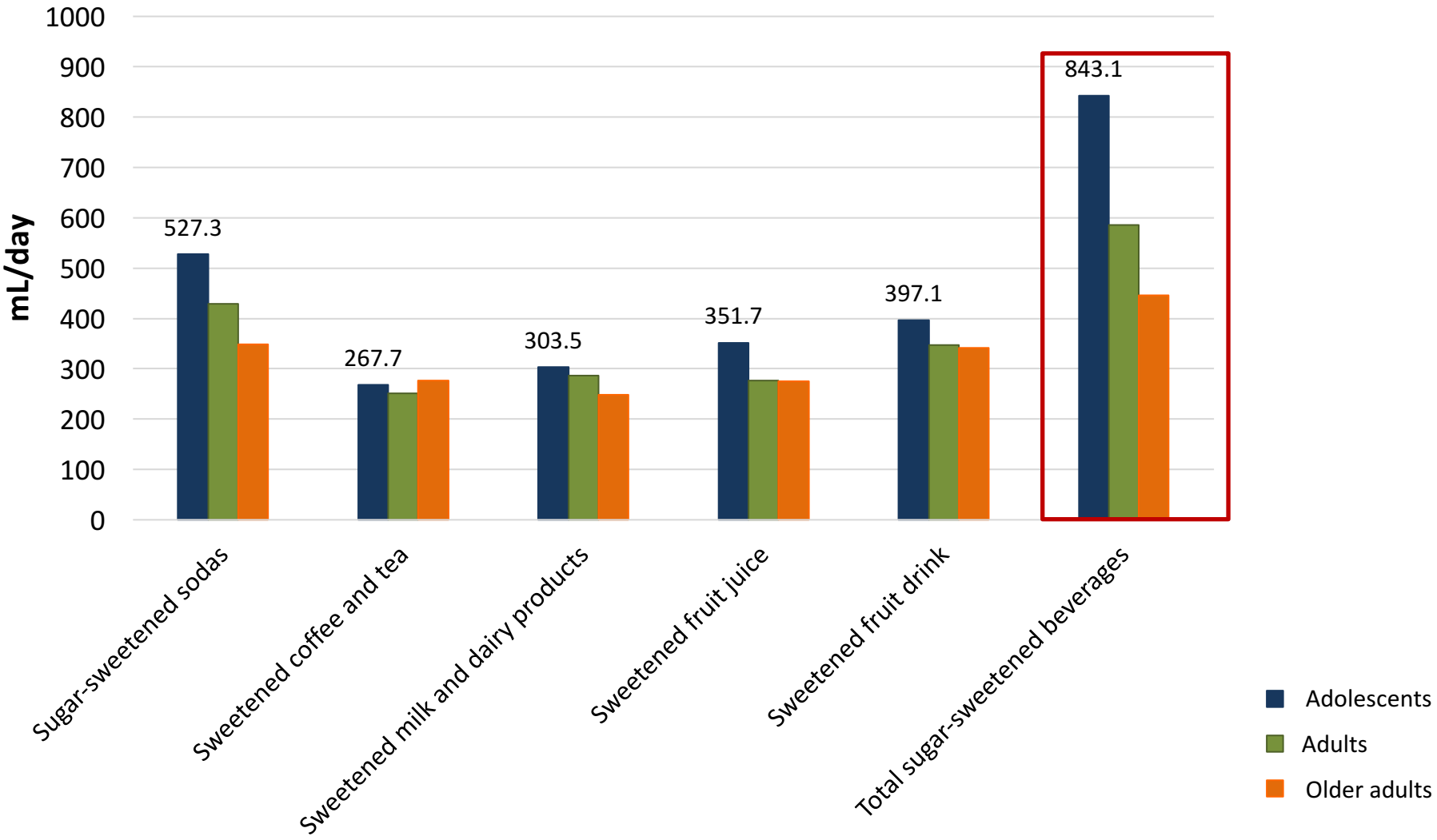
Rodríguez-Monforte M. *Br J Nutr* 2015



Nutrition Research

FOODS / FOOD GROUPS - OUTCOMES

Intake of sugar sweetened beverages among consumers according to age group in São Paulo, ISA-Capital, 2008



Fontes A, Fisberg RM. 2016

Demographic, socioeconomic, and lifestyle variables associated with sugar-sweetened beverage intake in residents in São Paulo. ISA-Capital 2008

	Adolescents		Adults		Older adults	
	β	95% CI	β	95% CI	β	95% CI
Sex [a]						
Female	**-152,6**	**-236,7; -68,4**	-54,1	-120,9; 12,7	-34,7	-90,4; 21,1
Alcohol consumption [b]						
Consumer	21,8	-49,3; 93,0	-35,9	-122,2; 50,4	1,8	-54,6; 58,2
Household per capita income[c]	-1,2	-3,0; 0,6	-0,5	-3,8; 2,7	**-2,7**	**-3,9; -1,6**
Body Mass Index [d]						
With excess body weight	**126,9**	**35,6; 218,2**	-35,9	-122,2; 50,4	**61,1**	**3,2; 118,9**
Physical activity [e]						
Sufficiently active	56,6	-20,0; 133,2	**99,8**	**6,5; 193,2**	83,7	-9,3; 176,7

[a]ref: male [b]ref: non-consumer [c]USD/month. Values divided per 100 USD [d]ref: without excess body weight [e]ref: insufficiently active

Adolescents
↓ female sex
↑ with excess body weight

Adults
↑ Sufficiently active

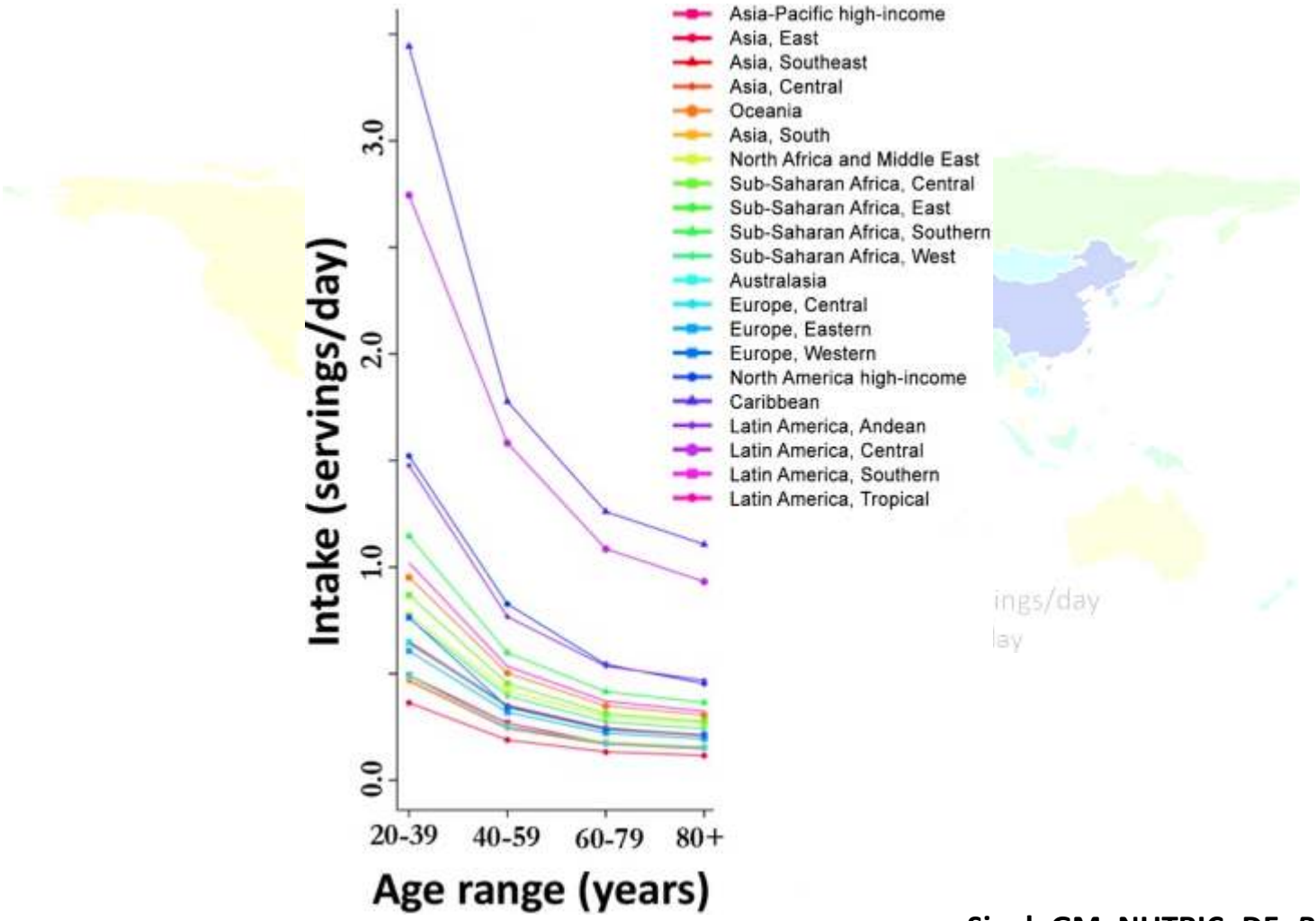
Older adults
↓ Household per capita income
↑ with excess body weight

Fontes A, Fisberg RM. 2016

DOI:10.1371/journal.pone.0124845 August 5, 2015

RESEARCH ARTICLE

Global, Regional, and National Consumption of Sugar-Sweetened Beverages, Fruit Juices, and Milk: A Systematic Assessment of Beverage Intake in 187 Countries



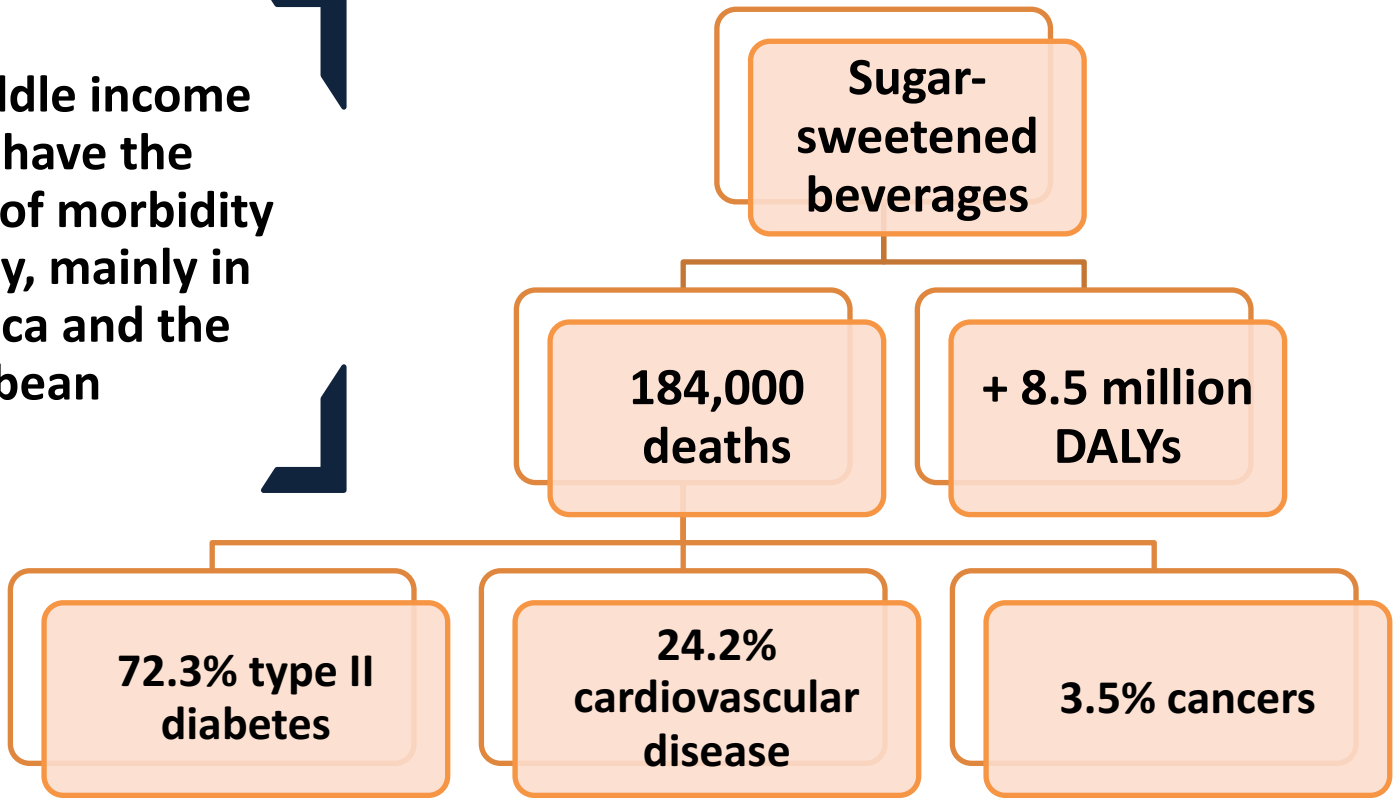
Singh GM, NUTRICoDE. *PLOS one* 2015

Circulation. 2015;132:639-666. DOI: 10.1161/CIRCULATIONAHA.114.010636.

Estimated Global, Regional, and National Disease Burdens Related to Sugar-Sweetened Beverage Consumption in 2010

Gitanjali M. Singh, PhD; Renata Micha, PhD; Shahab Khatibzadeh, MD; Stephen Lim, PhD; Majid Ezzati, PhD; Dariush Mozaffarian, MD, DrPH; on behalf of the Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE)*

Low and middle income countries have the highest rates of morbidity and mortality, mainly in Latin America and the Caribbean



Conclusions

- Dietary patterns allow us to evaluate quality of the diet or meals

- Which are the groups of risk in different populations and

- What are the association factors with health outcomes

Thank you

Gracias

Obrigado

GAC
Grupo de Pesquisa de Avaliação do Consumo Alimentar

www.gac-usp.com.br

PREFEITURA DE SÃO PAULO
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