Dietary patterns, fasting glucose, BMI, and waist circumference in US adolescents (NHANES, 2001-2004)

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Background

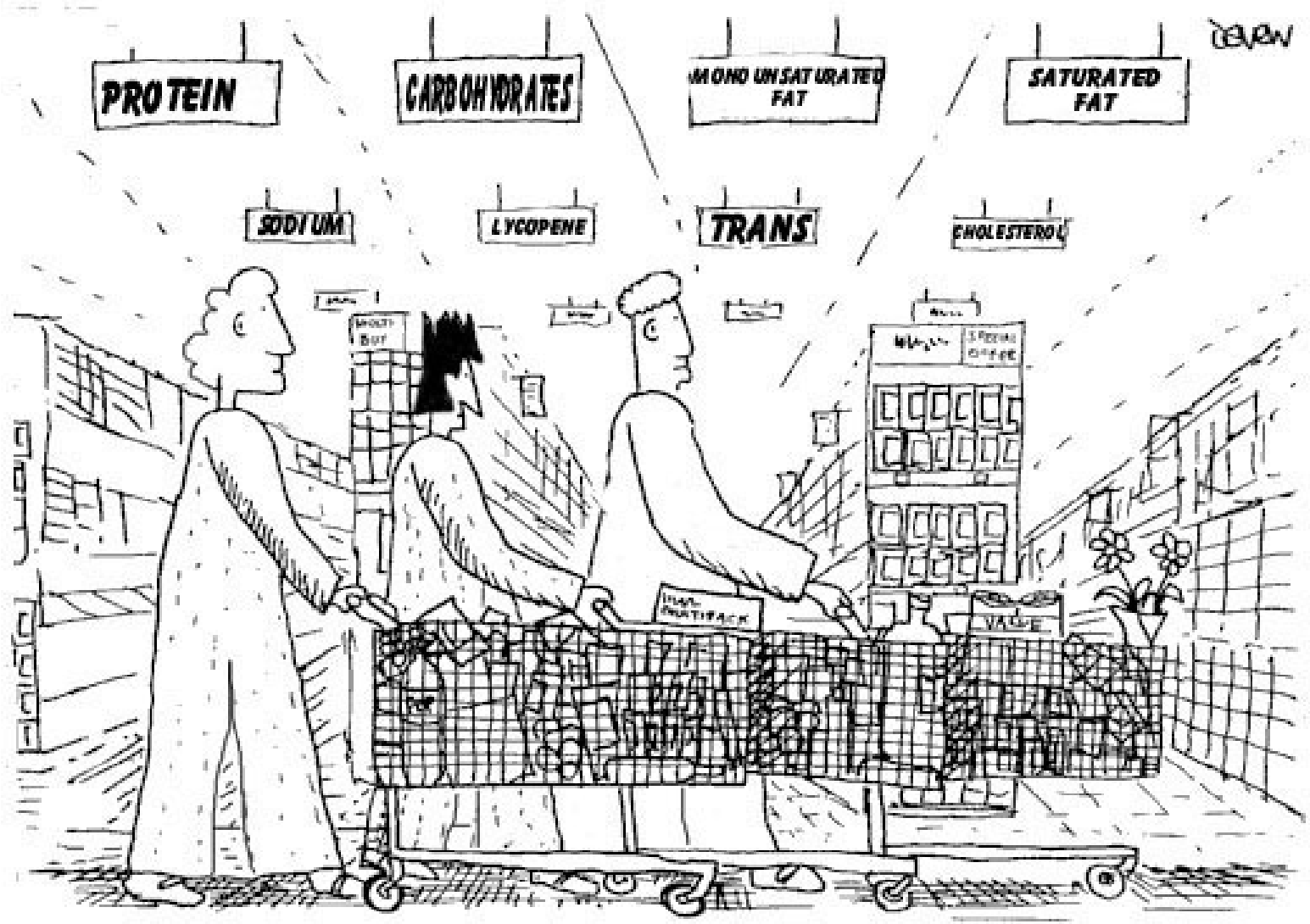
- Increasing prevalence of impaired fasting glucose (IFG) and obesity among US adolescents.
- Data furthering understanding of the relationship between diet, obesity, and IFG are sparse.

Objective

To identify dietary patterns in U.S. adolescents using principal component analysis and to quantify the effect of these patterns on fasting glucose levels, waist circumference, and BMI.

Hypothesis

- Two major dietary patterns will emerge: a Western pattern and a Healthy pattern.
- Western pattern:
  - Processed meats, eggs, red meats, high fat dairy products.
- American healthy pattern:
  - Green, leafy vegetables, salad dressings, tomatoes, other vegetables, cruciferous vegetables, tea.

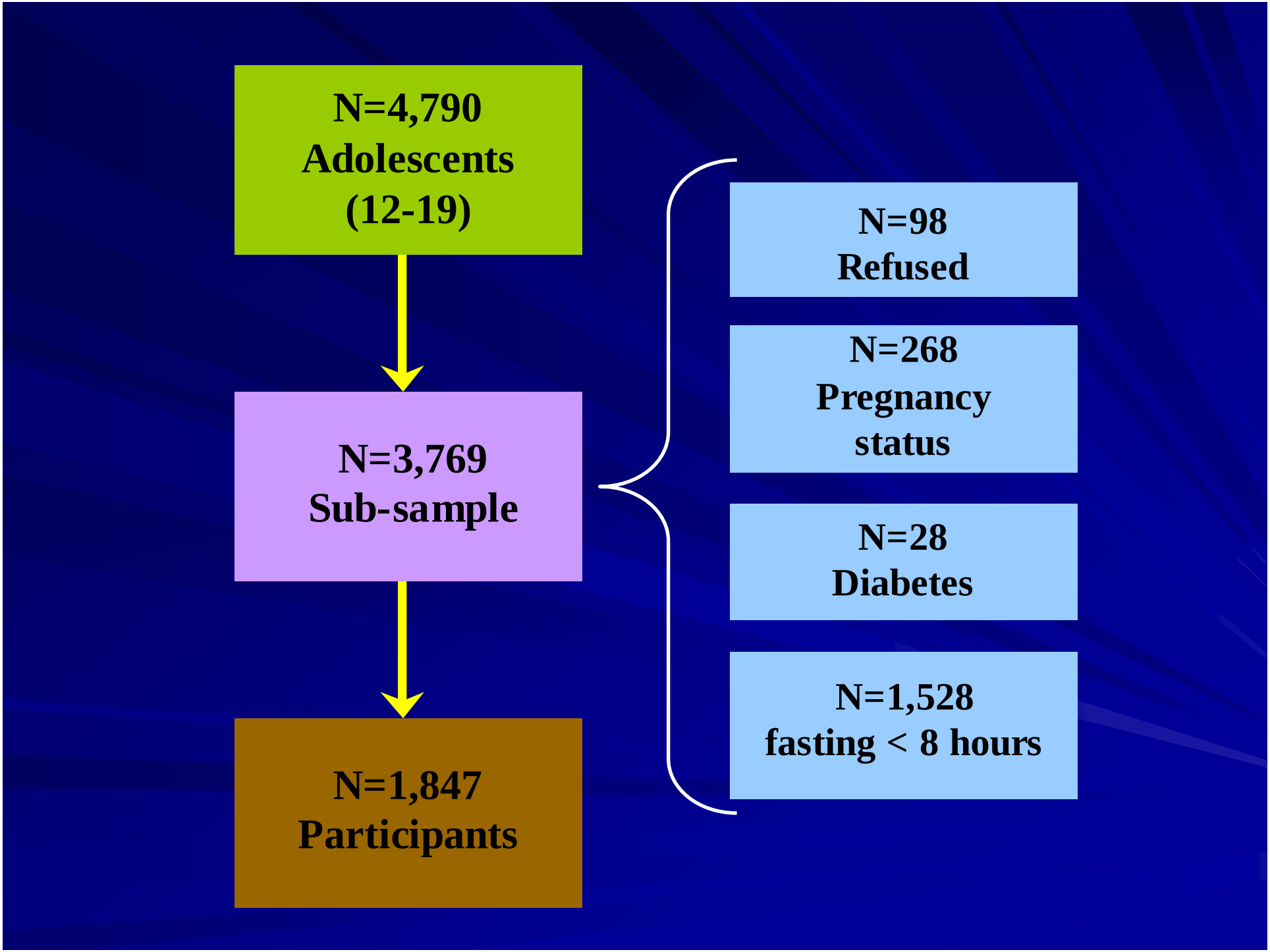


Advantages of Dietary Patterns

- Account for combinations of nutrients that may be interactive or synergistic.
- Create uncorrelated patterns from many highly correlated nutrients that may have small or undetectable effects on disease risk when considered alone.

Methods

- National Health and Nutrition Examination Survey data (NHANES 2001-2004).
- 24 hour dietary recall in person in the Mobile Examination Center (MEC).
- Blood and urine samples, weight, height and waist circumference collected in the MEC.
- Demographic characteristics and physical activity collected via interview in participant's home.



Methods

- Food groupings based on USDA food codes (n=40).
- SAS 9.1
  - PROC GLM
  - PROC FACTOR with weighted correlation matrix.
- SUDAAN 9.0
  - Adjusted least mean square values of outcome variables.

Table 1: Sample Characteristics

	Males	Females
Un-weighted n (%)	984 (53.3)	863 (46.7)
Weighted (n)	16,431,514	15,354,497
Race/Ethnicity (%)		
White, Non-Hispanic	62.7	63.8
Black, Non-Hispanic	14.1	14.3
Hispanic	16.2	15.7
Percent below poverty line	21.2	22.3
BMI (kg/m^2) (mean (SE))	23.1(0.2)	23.3(0.3)
Waist circumference (cm) (mean (SE))	81.3(0.7)	80.0(0.8)
Impaired fasting glucose (%)	16.5	6.0

Table 2: Factor loadings for food groups (n=40) derived using Principal Component Analysis.

	American Healthy	Western
Food group		
Green leafy vegetables	**0.65**	-0.10
Other vegetables	**0.48**	0.17
Tomatoes	**0.53**	-0.05
Fruit	**0.34**	-0.18
Salad dressing	0.43	**0.01**
Breakfast cereal	0.01	**-0.36**
Low fat dairy	0.14	**-0.35**
High energy drinks	**-0.30**	0.18
Burgers	**-0.24**	**0.32**
Potatoes	**-0.01**	**0.58**
Condiments	0.21	**0.60**

Table 3: Adjusted linear regression least mean square results (mean and SE) by quintile of factor score.

	Quintiles of factor scores			
	1 (lowest)	3	5 (highest)	P for trend
Waist circumference (cm)				
Western	78.3 (1.1)	80.5 (0.8)	82.6 (0.8)	<0.01
American Healthy	81.6 (1.3)	80.6 (0.7)	80.1 (1.0)	0.08
BMI (kg/m^2)				
Western	22.3 (0.4)	23.2 (0.3)	23.9 (0.3)	<0.01
American Healthy	23.4 (0.4)	23.2 (0.3)	23.1 (0.4)	0.14
Glucose (mg/dl)				
Western	92.0 (0.8)	91.9 (0.5)	91.0 (0.6)	0.50
American Healthy	92.2 (0.6)	91.8 (0.5)	91.0 (0.5)	0.14

Limitations

- PCA usually performed on FFQ data (FFQ not administered in 2001-2002).
- Diets may not be representative of long-term intake.
- Cross-sectional design.

Conclusions

- Adolescent American Healthy pattern:
  - **Same as adult:**
    - Positively correlated: Green, leafy vegetables, other vegetables, tomatoes, salad dressing.
  - **Unique:**
    - Positively correlated: Fruit
    - Negatively correlated: high energy drinks & burgers.
- Adolescent Western pattern:
  - **Same as adult**:
    - Positively correlated: Potatoes, red meat, & processed meat.
  - **Unique**:
    - Positively correlated: Burgers & condiments
    - Negatively correlated: low fat dairy & breakfast cereal.

Conclusions

- Western pattern associated with increased BMI and waist circumference.
- American Healthy pattern associated with a non-significant trend toward decreased BMI and waist circumference.
- No association of either pattern with glucose levels.
- Room for improvement in US adolescent diet!

Future directions

- 2005-2006 NHANES FFQ data.
- Other methods to derive dietary patterns (PLS, RRR)?

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