

The DASH Diet

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Hypertension (HTN) Prevalence

- 50 million hypertensive US adults
- One-third unaware
- *Less than half of American adults* have optimal blood pressure



Chronic high blood pressure (hypertension) left untreated can lead to:

- Stroke
- Blood vessel damage (arteriosclerosis)
- Heart attack or heart failure
- Kidney failure

ADAM.

■ Untreated hypertension can result in:

- Arteriosclerosis --Kidney damage
- Heart Attack --Stroke
- Enlarged heart --Blindness

Hypertension

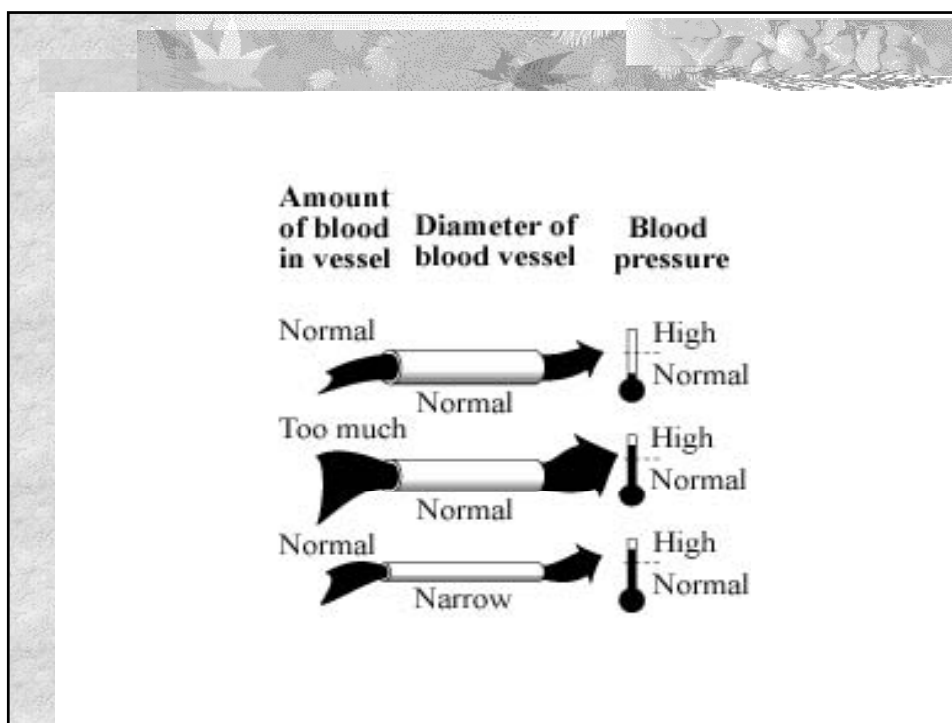
■ HTN means increased pressure in blood vessels: less space for blood to travel through

Blood Vessels

stress, inactivity

normal

atherosclerosis



Hypertension



Category	Systolic Blood Pressure	Diastolic Blood Pressure
Normal	< 120	<80
Pre-hypertension	120-139	80-89
Hypertension – Stage 1	140-159	90-99
Hypertension – Stage 2	≥160	≥100

Hypertension

- Approximately one in four American adults has hypertension.
- As many as 2.8 million *children* also have high blood pressure.
- The prevalence of hypertension increases *with age*.

Prevalence of Hypertension by Age

■ Age	■ % Hypertensive
■ 18-29	■ 4
■ 30-39	■ 11
■ 40-49	■ 21
■ 50-59	■ 44
■ 60-69	■ 54
■ 70-79	■ 64
■ 80+	■ 65

Hypertension

- When the normal regulatory mechanisms fail, hypertension develops.
- Hypertension is so dangerous because it gives off no warning signs or symptoms.
- The “silent” disease



Factors Influencing the Development of Hypertension

- High-normal blood pressure
- Family history of hypertension
- African-American ancestry
- Overweight
- Lifestyle factors:
inactivity/sodium/alcohol

Factors Influencing the Development of Hypertension

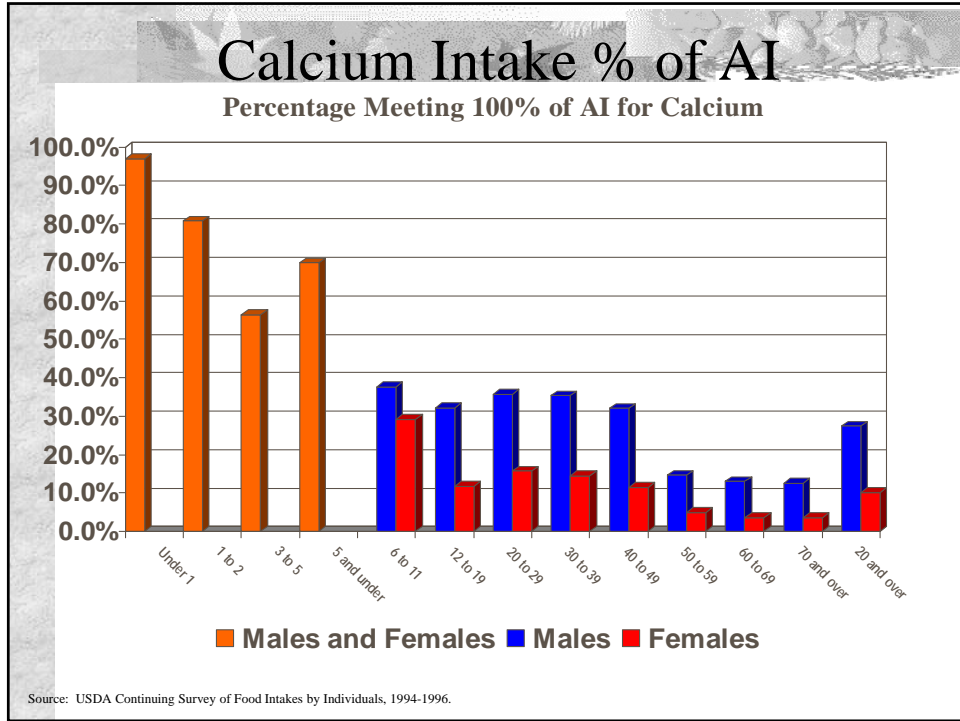
- Excess Consumption of Salt
- Certain segments of the population are '**salt sensitive**' because their blood pressure is affected by salt consumption



Mineral Intake and Hypertension

Calcium

- American Heart Association Statement
 - Increasing calcium intake may preferentially lower blood pressure in salt-sensitive people
 - Benefits more evident with low initial calcium intakes
(300-600 mg/day)



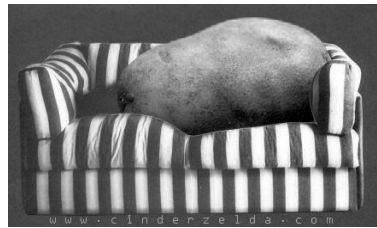
Factors Influencing the Development of Hypertension

- Alcohol consumption: Men 2 or less per day, Women 1 or less per day



Factors Influencing the Development of Hypertension

- Lack of Exercise
- Less active individuals are 30-50% more likely to develop hypertension.



Factors Influencing the Development of Hypertension

- Other Dietary Factors
- Low intake of Potassium: In population studies, dietary potassium and blood pressure are inversely related.
- **High potassium intakes are associated with lower BP.**
- **Good sources of Potassium:** sweet potato, tomato paste, white beans, yogurt, soybeans, tuna, banana, spinach, low-sodium tomato juice

Magnesium

- **Low intake of Magnesium:**
- Magnesium is a potent inhibitor of vascular smooth muscle contraction and may play a role in blood pressure regulation as a vasodilator.
- **Good sources of Magnesium:** halibut, almonds, cashews, soybeans, spinach, oatmeal, yogurt

Calcium: The most abundant mineral in the human body

- **Low intake of Calcium:** In the Nurse's Health Study, consuming the RDA for calcium (1200 mg/day) resulted in lower risk of developing hypertension than consuming lower levels (400 mg/day).
- **Good sources of Calcium:** yogurt, sardines, salmon, tofu, spinach, kale, milk

Effects of increasing Calcium-Rich Food

- Increases urinary sodium excretion
- Decreases blood volume
- Decreases peripheral vascular resistance
- Decrease blood pressure
- *Effects sustained for one-year period of study*

Treatment for Hypertension

- Maintain a healthy weight, lose weight if overweight.
- Be more physically active.
- Drink alcoholic beverages in moderation.
- Reduce the intake of salt and sodium in the diet to approximately 1500 mg/day.

The DASH Diet

- The **D**ietary **A**pproaches to **S**top **H**ypertension clinical trial (DASH)
- Diet rich in fruits, vegetables, and low fat dairy foods, can **substantially lower blood pressure** in individuals with hypertension and high normal blood pressure.

DASH is Unique

- Tested dietary patterns rather than single nutrients
- Experimental diets used common foods that can be incorporated into recommendations for the public
- Investigators planned the DASH diet to be fully compatible with dietary recommendations for reducing risk of CVD, osteoporosis and cancer

DASH Study Design

- 8-week randomization to one of three diets:
 - Control
 - ↑ Fruits and vegetables
 - Combination: ↑ fruits, vegetables and low fat dairy products
- Energy intake adjusted to ensure constant weight
- Sodium content of all three diets was approximately 3000 mg/daily (not low sodium)

DASH Subject Characteristics

- Systolic bp < 160 mm Hg
 - Average was 132 mm Hg
- Diastolic bp 80-95 mm Hg
 - Average was 85 mm Hg
- 459 randomized
 - 133 hypertensive
 - 326 normotensive
- 22 years and older
- 50% women
- 29% untreated hypertensive: not currently taking hypertensive meds



DASH Study Test Diets

Control diet

- Modeled after the typical American diet
- 37% fat, 15% protein
- Calcium deficient – 443 mg/day
- Potassium – 1700 mg/day
- Magnesium – 165 mg/day



DASH Study Test Diets

Fruit and vegetable diet

- Similar to control diet in fat and protein content
- Included 8-10 servings fruits and vegetables
- Calcium – 534 mg/day
- Potassium – 4101 mg/day
- Magnesium – 423 mg/day



DASH Study Test Diets

Combination diet

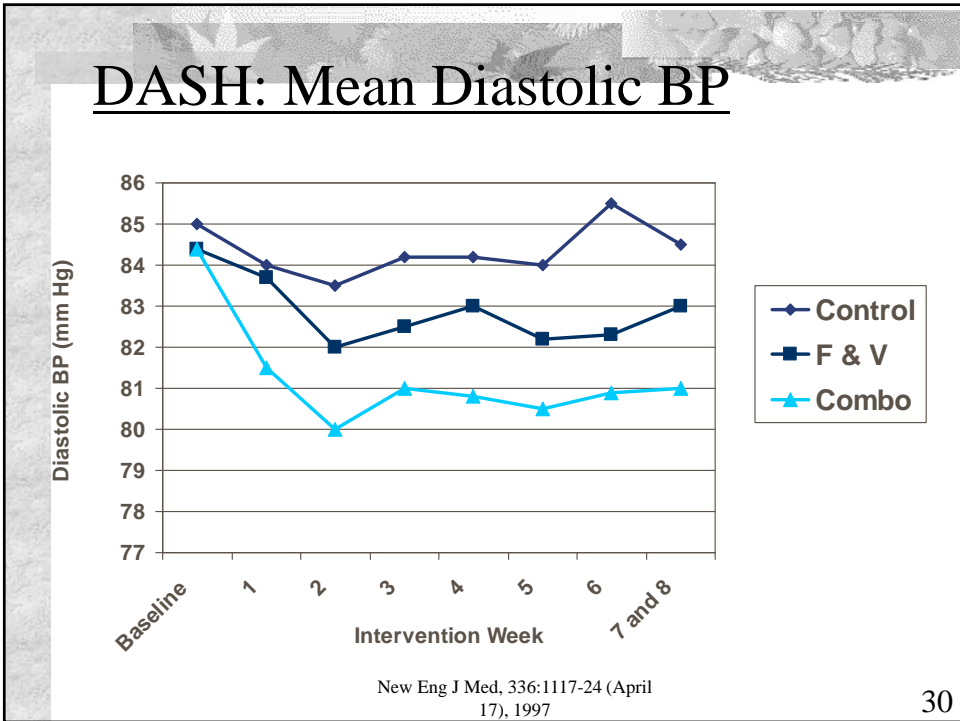
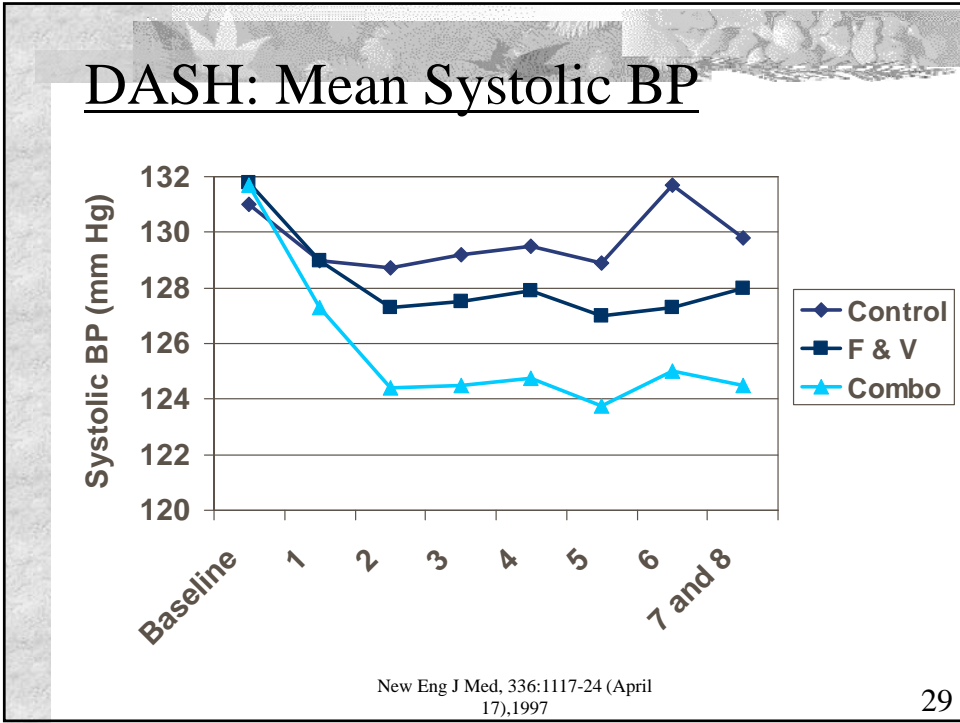
- Similar to fruit and vegetable diet
- Low fat and cholesterol
- At least 3 servings of dairy foods
- Calcium – 1265 mg/day
- Potassium – 4415 mg/day
- Magnesium – 480 mg/day



Controlled Feeding Trial



- 7-day menu cycle (21 meals)
- 4 calorie levels: 1600, 2100, 2600, 3100
- Lunch/dinner consumed on-site weekdays
- Weekend meals consumed off-site
- Adherence recorded



DASH Author's Conclusions

- Blood pressure reduction is rapid
- Blood pressure is *comparable to drugs*
- BP effect can be generalized to all Americans
- Dietary Ca/F&V effect independent of
 - Sodium intake
 - Weight change
- DASH has public health implications
 - Preventive measure against hypertension
 - Reduce stroke by 27% and CHD by 15%

DASH-Sodium

Effects on Blood Pressure of Reduced Dietary Sodium and the Dietary Approaches to Stop Hypertension (DASH) Diet

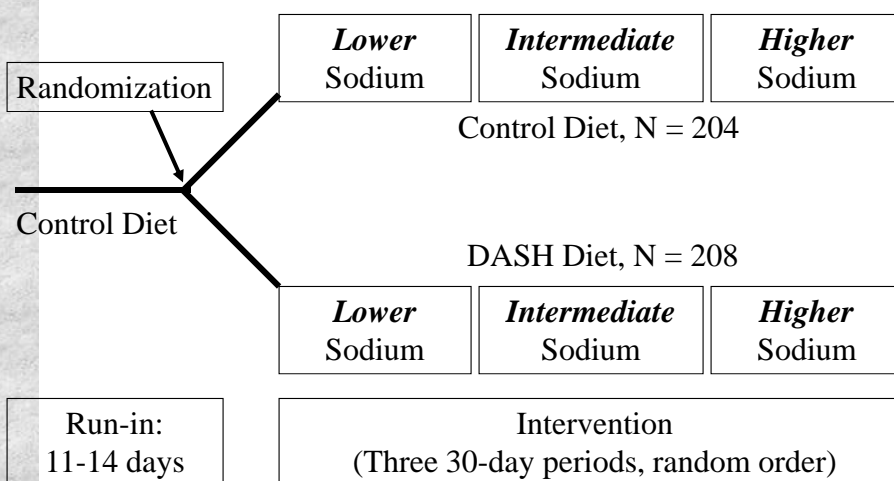
Sacks, F.M., et al. New England Journal of Medicine. Jan 4, 2001

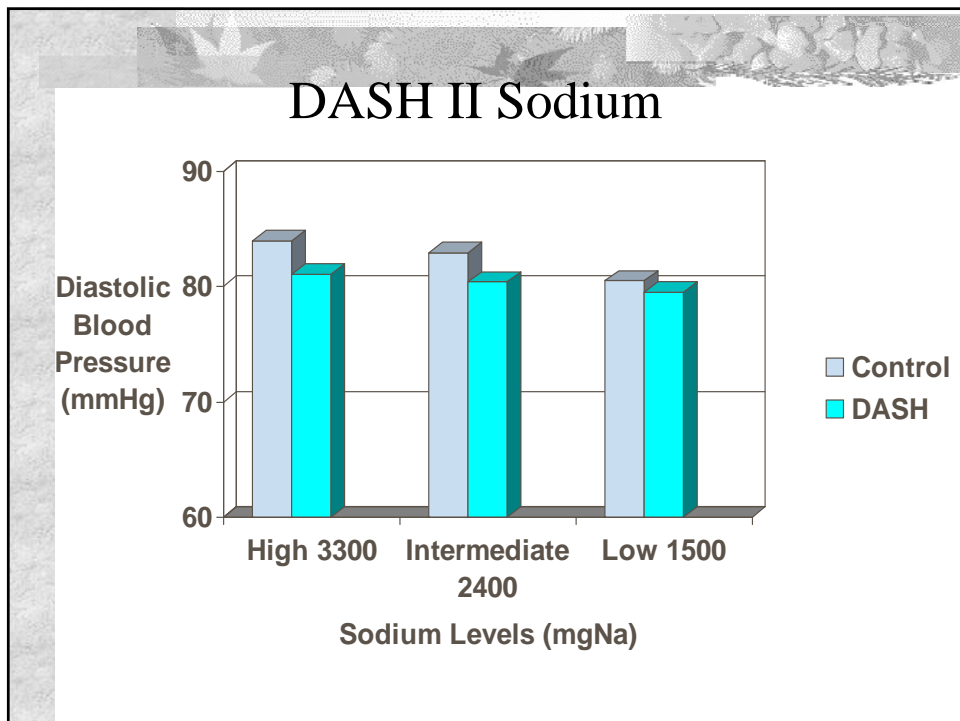
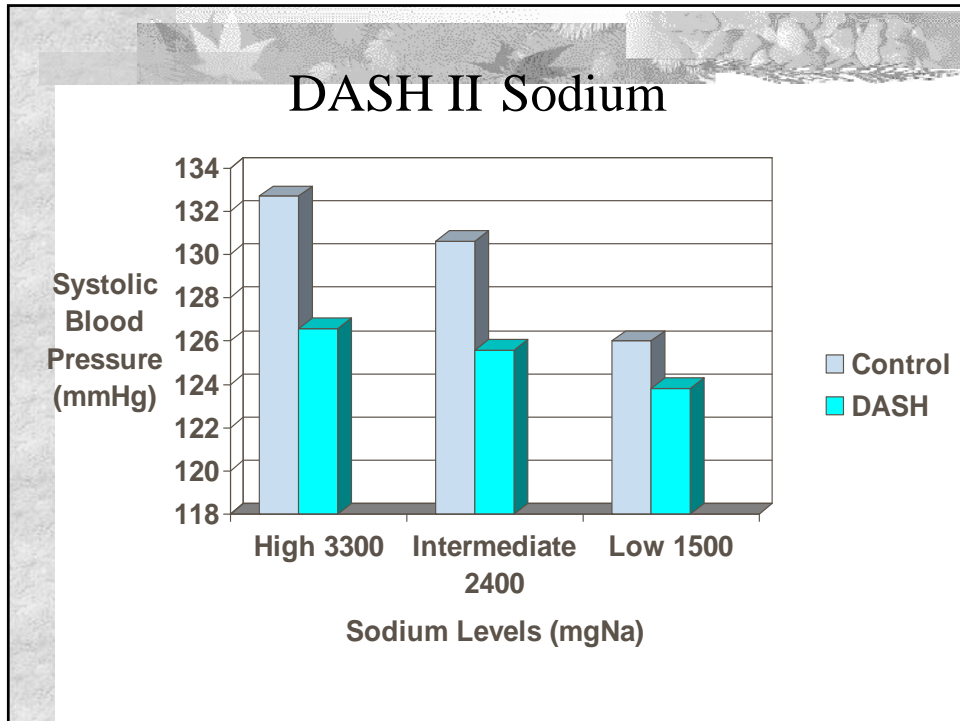
DASH-Sodium: Subjects

- 412 randomized
- 57% women
- 57% ethnic minority
- Systolic BP of 120-159 mmHg
- Diastolic BP of 80-95 mmHg
- 41% hypertensive

DASH-Sodium Trial: Study Design

Sodium levels: *Lower*: 1500 mg/day; *Intermediate*: 2400 mg/day; *Higher*: 3,300 mg/day





DASH-Sodium: Results

- At *each of the three levels of sodium* intake, blood pressure was lower for those on the DASH diet than for those on the control diet.
- Reducing dietary sodium lowered blood pressure for both the control and DASH diets in all participants.
- Largest reductions in blood pressure were found with the DASH diet at the lowest sodium intake.

DASH Reduces Homocysteine Levels

- Effect a result of diet high in vitamin B-rich milk and milk products, fruits and vegetables
- Lowering homocysteine with DASH may reduce CVD risk an additional 7%-9%

-Appel, et al. Circulation, 102:852, 2000

DASH Reduces Cholesterol

■ ↓ Total cholesterol 13.7 mg/dl

■ ↓ LDL cholesterol 10.7 mg/dl

■ ↓ HDL cholesterol 3.7 mg/dl

-Obarzanek, et al, Am J Clin Nutr, 74:80, 2001

DASH Diet Pattern

based on a 2,000 calorie diet

Food Group	Servings*
Grains	7-8
Vegetables	4-5
Fruits	4-5
Low-fat or fat free dairy	2-3
Meats, poultry, fish	less than 2
Nuts, seeds, dry beans and peas	4-5/week
Fats and oils	2-3
Sweets	5/ week

*servings varied from day to day,
average intake over a week close to
recommended

Killing many birds with one stone

DASH meets multiple dietary recommendations

- NIH-NHLBI-ATP III
- AHA
- USDA Dietary Guidelines
- NCI and AICR
- Surgeon General

Therapeutic Lifestyle Changes (TLC) for overall heart health

- Saturated fat: < 7% of total calories
- Cholesterol: < 200 mg/day
- Weight reduction
- Increased physical activity
- Viscous (soluble) fiber: 25-40 g/day
- Plant stanols/sterols: 2 g/day

Take Time for Some TLC

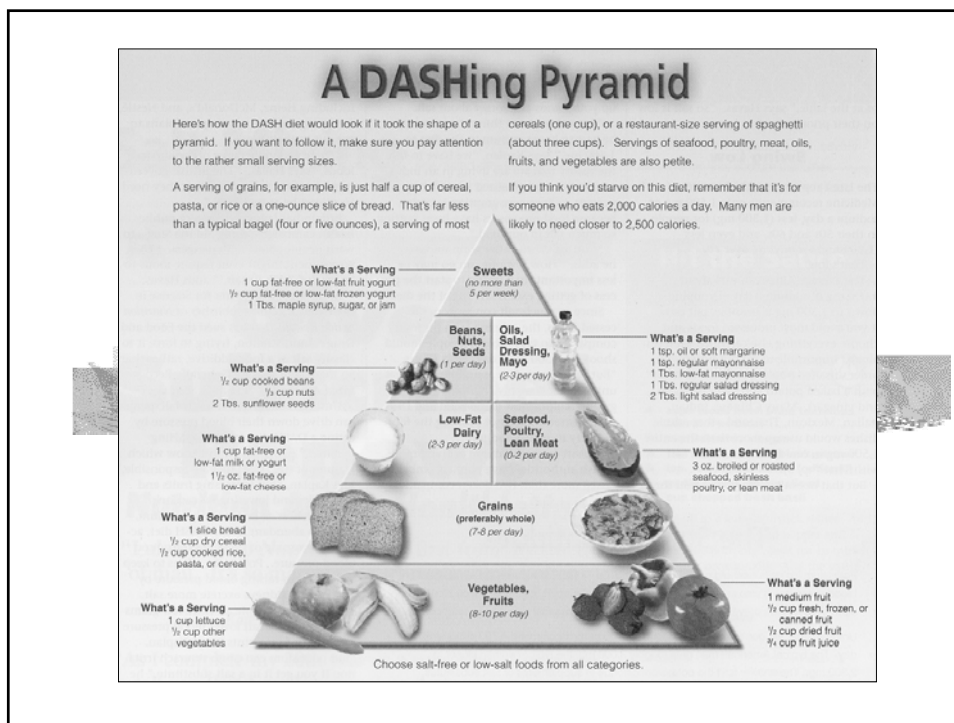
- Choose foods low in saturated fat
 - Whole grains
 - Fruits
 - Vegetables
 - Fat free or 1% dairy products
 - Lean meats, fish, skinless poultry
 - Dried peas/beans

Take Time for Some TLC (cont)

- Choose foods low in cholesterol
 - Plant-based foods
 - Grains
 - Fruits
 - Vegetables
 - Dried beans

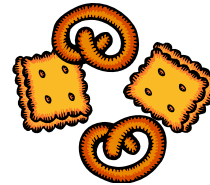


Nutrition Facts	
Serving Size ½ cup (114g)	
Servings Per Container 4	
Amount Per Serving	
Calories 90	Calories from Fat 30
% Daily Value*	
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	
Vitamin A 80%	Vitamin C 60%
Calcium 4%	Iron 4%
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
Calories: 2,000 2,500	
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	



Sodium: Are You Getting Too Much?

- Main sources of sodium in the average U.S. diet:
- 5% added while cooking
- 6% added while eating
- 12% from natural sources
- 77% from processed and prepared foods



Reducing Sodium in the Diet

- Use fresh poultry, fish and lean meat, rather than canned or processed.
- Buy fresh, plain frozen or canned with “no salt added” vegetables.
- Use herbs, spices and salt-free seasoning blends in cooking and at the table; decrease or eliminate use of table salt.
- Choose ‘convenience’ foods that are lower in sodium.

Reducing Sodium in the Diet

- When available, buy low- or reduced-sodium or 'no-salt-added' versions of foods like:
 - Canned soup, canned vegetables, vegetable juices
 - Low-fat cheeses
 - Condiments like soy sauce
 - Crackers and snack foods like nuts
 - Processed lean meats

Food Labels

Claim	Amount
Low Sodium	>140 mg/serving
Very Low Sodium	>35 mg/serving
Sodium Free	>5 mg/serving
Reduced Sodium	25% less than original

Summary

■ **Simple Changes: One at a Time**

- Add one more vegetable per day
- Snack on a piece of fruit instead of a cookie
- Buy low fat/nonfat milk and/or yogurt
- Use garbanzo beans on salads
- Have a 1/4 cup nuts as a snack



Summary

- Maintain normal body weight for adults
 - BMI 18.5-24.9 kg/m²
- Reduce sodium intake to no more than 1500 mg/day
- Regular physical activity – at least 30 minutes most days of the week
- Limit alcohol consumption
- Maintain adequate potassium intake
- Consume a diet rich in fruits, vegetables and low-fat dairy products
- Reduce saturated fat and total fat in diet

DASH website

- www.dashdiet.org
- Excellent website for information on Dietary Approaches to Stop Hypertension

