



Computer-based Personal Nutrition Guidance

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Barriers for personalized nutrition

1. Utility in practice

The prevailing view is that the use of genetic information will add only minimal health benefits when added to current recommendations, and that the impact of individual variants is minute.

2. Protection of genetic data

The concern is that the discrimination risks and the psychological burden of genetic information may be too great to offset the minor health benefits.

3. Delivery of practical guidance

It is said that adapting intakes of multiple nutrients to numerous genetic variants is too difficult for health professionals and lay consumers alike.

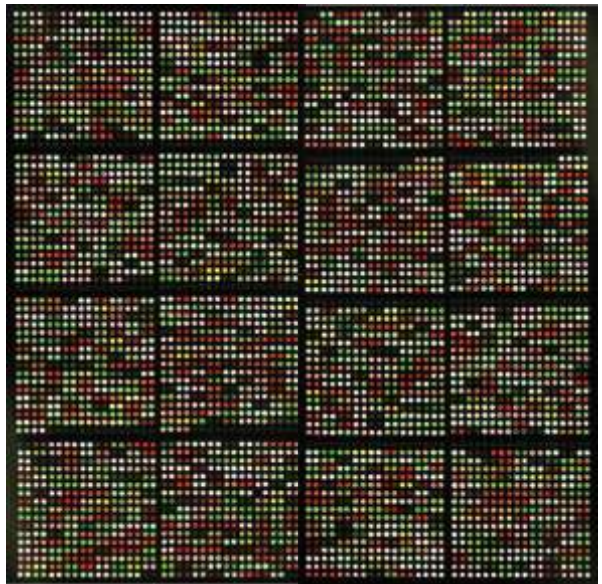


Some genes for tailoring nutrition guidance

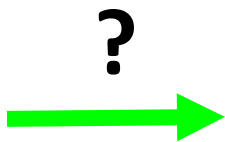
APOA2	ALOX5	LCT	XRCC1	ABCG2
F2	CETP	SEP15	MPO	SLC2A9
F5	FADS1	UGT1A1	MTP	CFTR
IL6	FADS2	PON1	SOD2	SIRT1
UCP1	FABP2	ALPL	CD36	PLIN
UCP3	GFOD2	ESR2	OTC	CLOCK
ADH1B	CYP4F2	HFE	PAPOLG	TCF7L2
ALDH2	VDR	TMPRSS6	TAS2R38	PNPLA3
CYP1A2	GC	SLC40A1	TAS2R50	FTO
ADORA2A	FUT2	HAMP	TAS1R3	MC4R
MTHFR	TCN2	NAT1	TAS1R2	TFAP2B
DHFR	HP	NAT2	TAS2R3	FABP2
MTHFD1	COX2	XPC	TAS2R4	PPARG
PEMT	GSTM1	TRPM7	TAS2R5	ADRB2
AGT	GSTP1	CUBN	TAS2R5	ADRB3
ADD1	PTGS2	SLC23A1	TAS2R19	TNFA
SLC4A5	MGMT	SLC23A2	HLA-DQA1	IRS1
GRK4	CASR	PLA2G4A	HLA-DQB1	SLC30A3



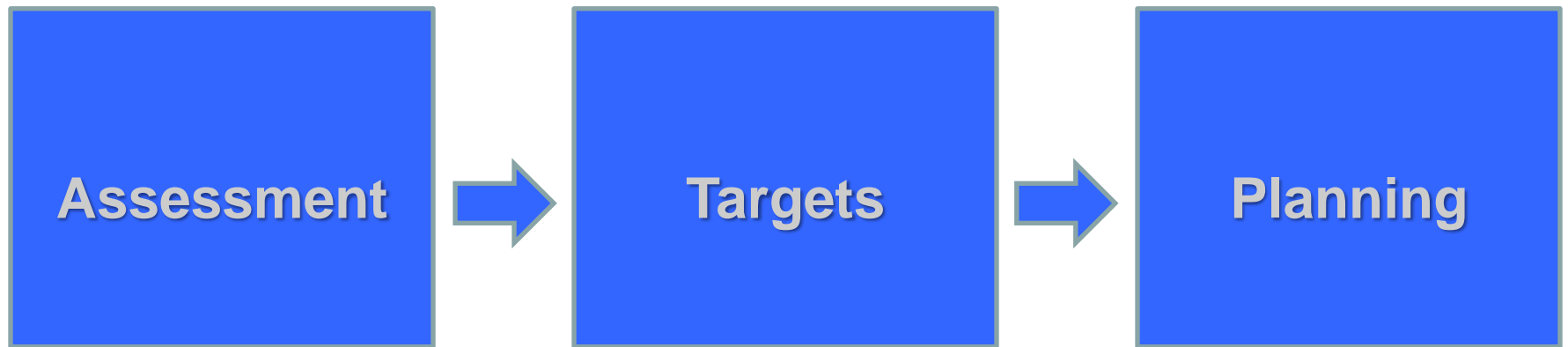
Information overload



Laboratory

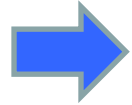


Client





Assessment



Targets

Age
Gender
Weight
Height
Exercise
Conditions
Medications

....

Genetics

Diet patters
Food groups
Macronutrients
Individual fats
Minerals
Micronutrients
Bioactives

RESET

EXPLORE YOUR NUTRITION TARGETS

This application is intended for educational and informational use only, and is not for diagnostic use. This application has not been evaluated by the FDA, and is not intended to diagnose, treat, cure, or prevent any disease. For nutrition guidance talk to a dietitian or other licensed health care provider.

1. BASIC INFORMATION

Age: 36

Sex: female, not_pregnant

2. HEIGHT & WEIGHT

3. EXERCISE

4. RISK FACTORS

5. GENETICS

Where our numbers come from: The standard recommendations are from the most recent Dietary Intake Recommendations, published by the [National Academies Press](#). Scientist-developed rules are then used to take into account user-specific information.

Nutrient	Standard (DRIs)	Personalized
Calories	1839 kcal	*

[RESET](#)

EXPLORE YOUR NUTRITION TARGETS

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1. BASIC INFORMATION ✓

2. HEIGHT & WEIGHT ✓

3. EXERCISE ✓

4. RISK FACTORS ✓

5. GENETICS ✗

To incorporate genetics: [CLICK HERE](#)

Where our numbers come from: The standard recommendations are from the most recent Dietary Intake Recommendations, published by the [National Academies Press](#). Scientist-developed rules are then used to take into account user-specific information.

Nutrient	Standard (DRIs)	Personalized
Calories	1839 kcal	1993 kcal
Protein	60.4 g	64 g

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1. BASIC INFORMATION ✓

2. HEIGHT & WEIGHT ✓

3. EXERCISE ✓

4. RISK FACTORS ✓

5. GENETICS ✓

Where our numbers come from: The standard recommendations are from the most recent Dietary Intake Recommendations, published by the [National Academies Press](#). Scientist-developed rules are then used to take into account user-specific information.

Nutrient	Standard (DRIs)	Personalized
Calories	1839 kcal	1793.7 kcal
Protein	60.4 g	64 g
Saturated Fat	<22.4 g	<22.4 g
Sodium	<2300 mg	<2300 mg
Cholesterol	<300 mg	<300 mg
Carbohydrates	253 g	269 g
Sugar	<27 g	<27 g
Folate	400 mcg	510 mcg
Folic Acid	400	400



Assessment

Age
Gender
Weight
Height
Exercise
Conditions
Medications
.....
Genetics

Targets

Diet patters
Food groups
Macronutrients
Fats
Minerals
Micronutrients
Bioactives

Planning

Behavioral Change
(limit snacking)
General guidelines
(eat more vegetables)
Specific directions
(limit to 1 cup of coffee)
Meal plans and tips
Dietary supplements
(300 IU Vitamin E)



So far, so good, now they know the targets



Client

DNA



Lab

Genetics

Height	6'00.00"
Gender	Male
Frame	SL
Weight	170 lb
Waist	34 in
Diastolic	90 mmHg
Systolic	130 mmHg
Age	35
Sex	Male
Exercise	None
Height	5'10.00"
Weight	160 lb
Waist	32 in
Diastolic	85 mmHg
Systolic	125 mmHg
Age	30
Sex	Male
Exercise	None

Website

Targets



Dietitian



Let the personal nutrition counseling begin



Client

DNA



Lab

Genetics



Height	5'10"
Gender	Male
Weight	175
Age	35
Activity	Sedentary
Cholesterol	180 mg/dL
Blood Pressure	120/80
Glucose	100 mg/dL
Hemoglobin A1c	5.6%
Iron	50 mcg
Vitamin D	20 IU
Calcium	1000 mg
Fiber	25 g

Website

Targets



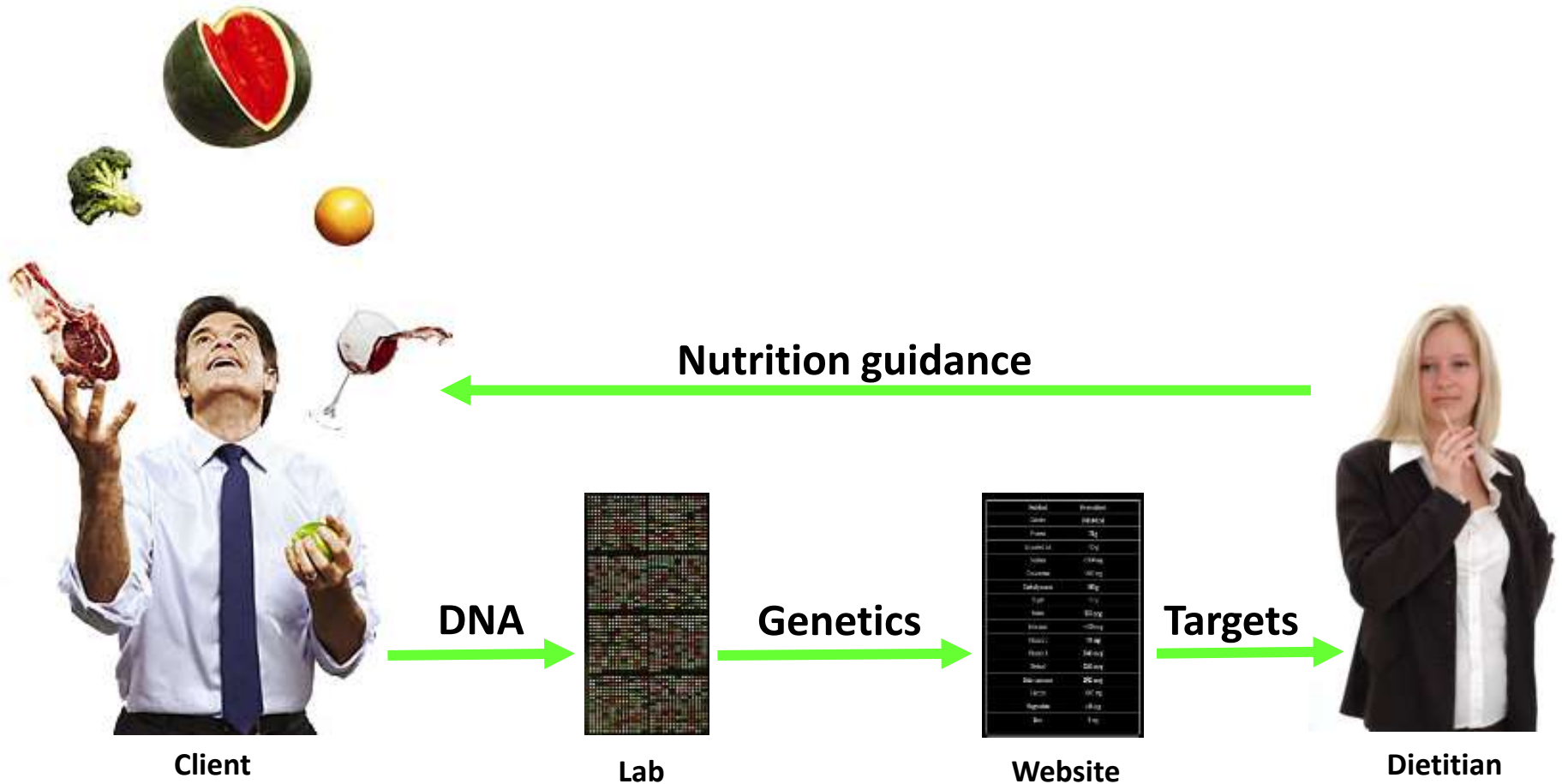
Dietitian

Nutrition guidance





Now the difficult part: making food choices





Personal Online Nutrition Guidance (PONG)

→ with an online meal planning tool that is

- **based on individual intake targets**
- **meeting 16 targets at a time**
- **using individually selected target sets**
- **through dietitian or self-administered**

<http://nutrigen.com/nutrition/guidance.html>



My Nutrition Indicator

Brief Assessment

Red Meat	High
Fruit	Low
Vegetables	Low
Folate	Good
Vitamin C	Good
Beta-Carotene	Good
Calcium	Low


last updated 9/20/2010
Your personal ID is 766

Information Updates

- Update Personal Data
- Update Exercise Info
- Update Diet Questions
- Record Daily Intake
- Adjust Calories

My Menus | **My Archive** | **Search** | **Instructions**

unassigned | Mo, 1/3 | **Tu, 1/4** | We, 1/5 | Th, 1/6 | Fr, 1/7 | Sa, 1/8 | Su, 1/9 | Mo, 1/10

 Week

Tomorrow no menu selected

Menus go here

Click the button below to find a menu

[Find Menu](#)

This is your mealplan page. Add a new menu for any of the next seven days.

You can also delete or change previously selected menus.

Click on the printer icon above to print the mealplans for the entire week.

Resources

- Meal Planning Tips
- Genetic Information
- Nutrition News

Type message below

[Click here to send message](#)

A: The soy milks have been added.
Q: add Silk Light Vanilla, Plain and Chocolate milk

This on-line tool helps users put together their personal meal plans based on who they are and how they live. Genotype information is never displayed.



My Menus

My Archive

Search

Instructions

best

worst



Rate this combination

Excellent combination

Score=36

Rcp indicates a link to a recipe

Breakfast+Snacks

- Nature'sPath Optimum Rebound 2 cups
- Milk 2% fat, 1.5 cups
- Apple w/skin, 1 medium-sized
- Orange Juice med.glass (6 oz)

Lunch+Snacks

- Rcp Lemon Bulgur Chickpea Pilaf, 1.5 cups
- Rcp Tom/Cucumb/RedOnion/MintSalad 1/2 cu
- Libby's Trop.fruit salad 1 cup
- Non-fat fruit yogurt, 4 oz cup

Dinner+Snacks

- TJ Mexicaine Quiche, 1/2 a pie
- White Rice, cooked, 1.5 cups
- Plum, half a fruit
- Dark Chocolate 1 bar 1/2 oz

Nutrients in combined foods

Energy:	2021 kcal	(target = 2031 kcal)
Protein:	77 g	(target = 45 g)
Saturated Fat:	18 g	(target under 22 g)
Cholesterol:	127 mg	(target under 323 mg)
Folate:	416 µg	(target = 431 µg)
Added Folate:	179 µg	(target under 431 µg)
Vitamin C:	203 mg	(target = 81 mg)
Iron:	19 mg	(target = 19 mg)
Sodium:	1439 mg	(target under 1616 mg)
Calcium:	1039 mg	(target = 1077 mg)
Magnesium:	525 mg	(target over 345 mg)

Previous Menu

Choose This Menu

Next Menu

Back to Mealplans

The first step is to browse through potential meal plans. The traffic-light color code indicates menu fit to targets.



My Menus My Archive Search Instructions

best worst

Rate this combination

Excellent combination **Score=36** **Rcp indicates a link to a recipe**

Breakfast+Snacks	Lunch+Snacks	Dinner+Snacks
Nature'sPath Optimum Rebound 2 cups	Rcp Lemon Bulgur Chickpea Pilaf, 1.5 cups	TJ Mexicaine Quiche, 1/2 a pie
Milk 2% fat, 1.5 cups	Rcp Tom/Cucumb/RedOnion/MintSalad 1/2 cu	White Rice, cooked, 1.5 cups
Apple w/skin, 1 medium-sized	Libby's Trop.fruit salad 1 cup	Plum, half a fruit
Orange Juice med.glass (6 oz)	Non-fat fruit yogurt, 4 oz cup	Dark Chocolate 1 bar 1/2 oz

Nutrients in combined foods

Energy:	2021 kcal	(target = 2031 kcal)
Protein:	77 g	(target = 45 g)
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Magnesium:	525 mg	(target over 345 mg)

Previous Menu Choose This Menu Next Menu

Back to Mealplans

This profile uses the standard, 10% saturated fat intake target.

3. Delivery of practical guidance

The screenshot displays a meal planning application interface. At the top, there are navigation tabs: 'My Menus', 'My Archive', 'Search', and 'Instructions'. Below these is a printer icon labeled 'Day' and a rating system with five circles and the text 'Rate this combination'. The main content area is titled 'Excellent combination' with a 'Score=13' and a note 'Rcp indicates a link to a recipe'. It lists three meal categories: 'Breakfast+Snacks', 'Lunch+Snacks', and 'Dinner+Snacks', each with specific food items and quantities. Below the menu is a table of 'Nutrients in combined foods' with values and targets. The 'Saturated Fat' row is circled in red. At the bottom, there are buttons for 'Previous Menu', 'Choose This Menu', 'Next Menu', and 'Back to Mealplans'.

Nutrients in combined foods		
Energy:	2009 kcal	(target = 2031 kcal)
Protein:	64 g	(target = 45 g)
Saturated Fat:	6 g	(target under 7 g)
Cholesterol:	0 mg	(target under 323 mg)
Folate:	436 µg	(target = 431 µg)
Added Folate:	40 µg	(target under 431 µg)
Vitamin C:	165 mg	(target = 81 mg)
Iron:	19 mg	(target = 19 mg)
Sodium:	949 mg	(target under 1616 mg)
Calcium:	1044 mg	(target = 1077 mg)
Magnesium:	916 mg	(target over 345 mg)

This profile uses a low, 3.3% saturated fat intake target, possibly helpful for ApoA2 -265 CC carriers.



My Menus

My Archive

Search

Instructions

best

worst



Rate this combination

Excellent combination

Score=13

Rcp indicates a link to a recipe

Breakfast+Snacks

Lunch+Snacks

Dinner+Snacks

Rcp Oatmeal cooked w/water 2 cups

Amy's LightSodium BlackBeanEnchilada 2

Rcp Vegetarian meatloaf, 1 slice

View the details of this item

Pear, one large fruit

Rcp Lemon Bulgur Chickpea Pilaf, 2 cups

Delete this item

Kellogg's Nutri-Grain Apple Cinn., 1 bar

Rcp Avocado Fruit Salad, 1.5 cups

Add any new item

White wine, 1 small glass 5 oz

Replace this with a similar item

Red or green grapes, 1/2 cup

Replace this with a different item

Select larger portion

Select smaller portion

Nutrients in combined foods

Energy:	2009 kcal	(target = 2031 kcal)
Protein:	64 g	(target = 45 g)
Saturated Fat:	6 g	(target under 7 g)
Cholesterol:	0 mg	(target under 323 mg)
Folate:	436 µg	(target = 431 µg)
Added Folate:	40 µg	(target under 431 µg)
Vitamin C:	165 mg	(target = 81 mg)
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Sodium:	949 mg	(target under 1616 mg)
Calcium:	1044 mg	(target = 1077 mg)
Magnesium:	916 mg	(target over 345 mg)

Previous Menu

Choose This Menu

Next Menu

Back to Mealplans

And if they don't like oatmeal, users can easily look for alternatives.



My Menus

My Archive

Search

Instructions

best

worst



Rate this combination



Now choose a substitute below on the right:

Excellent combination

Score=13

Rcp indicates a link to a recipe

Breakfast+Snacks

Lunch+Snacks

Dinner+Snacks

Replace Rcp Oatmeal cooked w/water 2 cups

Nutrients in combined foods

Energy:	2009 kcal	(target = 2031 kcal)
Protein:	64 g	(target = 45 g)
Saturated Fat:	6 g	(target under 7 g)
Cholesterol:	0 mg	(target under 323 mg)
Folate:	436 µg	(target = 431 µg)
Added Folate:	40 µg	(target under 431 µg)
Vitamin C:	165 mg	(target = 81 mg)
Iron:	19 mg	(target = 19 mg)
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Magnesium:	916 mg	(target over 345 mg)

Select an item below (rated from *** Excellent to -- Poor)

no change

- *** TJ Twigs,Flakes&Clusters, 2.5 cups
- *** Rcp Oatmeal cooked w/water 2 cups
- *** Weetabix whole wheat cereal 1.5 cups
- *** Kashi GOLEAN cereal 2 cups
- *** Kashi GOLEANCrunch Original, 2 cups
- *** Weetabix whole wheat cereal 2 cups
- *** TJ Golden Flax Cereal 1.5 cups
- *** Old fashioned Quaker Oats dry, 1.25 cups

3. Delivery of practical guidance

The screenshot displays a meal planning application interface. At the top, there are navigation tabs: "My Menus", "My Archive", "Search", and "Instructions". A "Print Day" button is centered above the menu. To the right, a rating system shows five circles, with the first one filled, and the text "Rate this combination".

The main menu area is titled "Excellent combination" with a "Score=13". It is divided into three columns: "Breakfast+Snacks", "Lunch+Snacks", and "Dinner+Snacks".

Breakfast+Snacks	Lunch+Snacks	Dinner+Snacks
Rcp Oatmeal cooked w/water 2 cups	Amy's LightSodium BlackBeanEnchilada 2	Rcp Vegetarian meatloaf, 1 slice
SILK Light Plain soymilk, 1 cup	Pear, one large fruit	Rcp Lemon Bulgur Chickpea Pilaf, 2 cups
Grapefruit red or pink whole fruit	Kellogg's Nutri-Grain Apple Cinn., 1 bar	View the details of this item

A context menu is open over the selected item "Rcp Lemon Bulgur Chickpea Pilaf, 2 cups", listing options: "View the details of this item", "Delete this item", "Add any new item", "Replace this with a similar item", "Replace this with a different item", and "Select smaller portion".

At the bottom, a "Nutrients in combined foods" table is shown:

Nutrients in combined foods		
Energy:	2009 kcal	(target = 2031 kcal)
Protein:	64 g	(target = 45 g)
Saturated Fat:	6 g	(target under 7 g)
Cholesterol:	0 mg	(target under 323 mg)
Folate:	436 µg	(target = 431 µg)
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Magnesium:	916 mg	(target over 345 mg)

Navigation buttons at the bottom include "Previous Menu", "Choose This Menu", "Next Menu", and "Back to Mealplans".

Nutrient content and other information is readily available for each meal item.



[Back to Menus](#)

Rcp Lemon Bulgur Chickpea Pilaf, 2 cups

great

Nutrients

Energy:	382 kcal
Protein:	16 g
Saturated Fat:	1.48 g
Cholesterol:	0 mg
Folate:	168 µg
Added Folate:	0 µg
Vitamin C:	68 mg
Iron:	5.4 mg
Sodium:	300 mg
Calcium:	120 mg
Magnesium:	492 mg
Red Meat:	0 g
Fruits/Veggies:	0 g
Vitamin A:	2000 IU
Preformed Vit.A:	0 IU
Beta-Carotene:	2000 IU

[Click here to view more details](#)

The recipe or manufacturer's information will come up in a separate window at a website not related to this one. This link does not indicate an endorsement.

External links take the user to popular cooking sites and other resources.



Eat a Variety of Fruits & Vegetables Every Day



Recipes



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[Fruit & Vegetable of the Month](#)

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Lemon Bulgur and Chickpea Pilaf



[Printable Version](#)



[Email Recipe](#)



[Add to Cookbook](#)



Recipe Summary:

Preparation Time: 30 minutes

Number of Servings: 6

Cups of Fruits and Vegetables Per Person: 0.50

Ingredients:

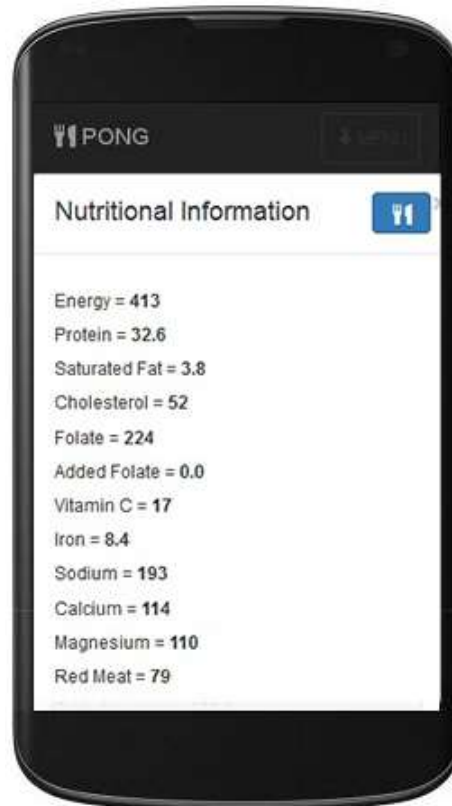
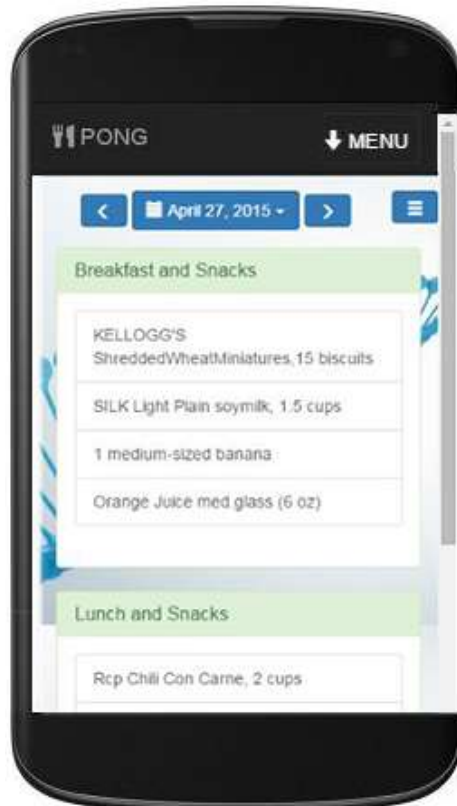
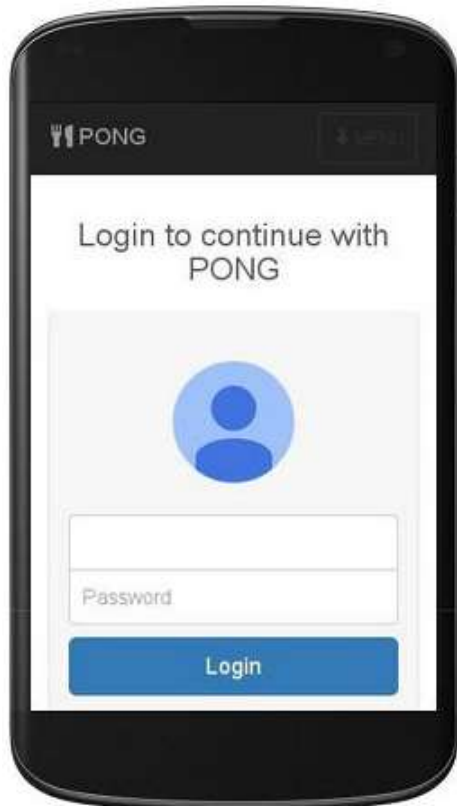
- 1 cup medium grind bulgur
- 2 cups vegetable stock
- 1 tsp ground cumin, divided
- 1 Tbsp olive oil
- 1 small onion, chopped
- 1 small green bell pepper, chopped
- 3 cloves garlic, minced
- 2 cups canned chickpeas, rinsed and drained
- 1/3 cup fresh lemon juice
- 1 cup fresh chopped parsley

Directions:

Place bulgur in a bowl. Bring stock to a boil, add half the cumin, and pour stock over bulgur. Stir once and let sit 10 to 15 minutes, until most of the liquid has been absorbed and bulgur is fluffy. Heat oil in a heavy nonstick skillet over medium heat. Sauté onion, green pepper and half the garlic 3 to 5 minutes, stirring, until onion is translucent. Add remaining garlic and cumin. Sauté about 30 seconds. Stir in bulgur and chickpeas. Stir together a few minutes. Then add remaining ingredients, combine well and season with salt and pepper to taste. Serve hot.



A version for mobile devices





Conclusion:

The Personal Online Nutrition Guidance application helps users to consume foods and nutrients in amounts that are tailored to who they are and what they do.

The high degree of individual choice and culinary guidance helps to select appropriate food types and amounts.

Captured usage information can trigger alerts about potential compliance problems and individually direct support messages to users needing them most.