

# DIABETES AND CHOLESTEROL AT THE HEALTH FAIRS

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# DOCS

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Department of Community Service

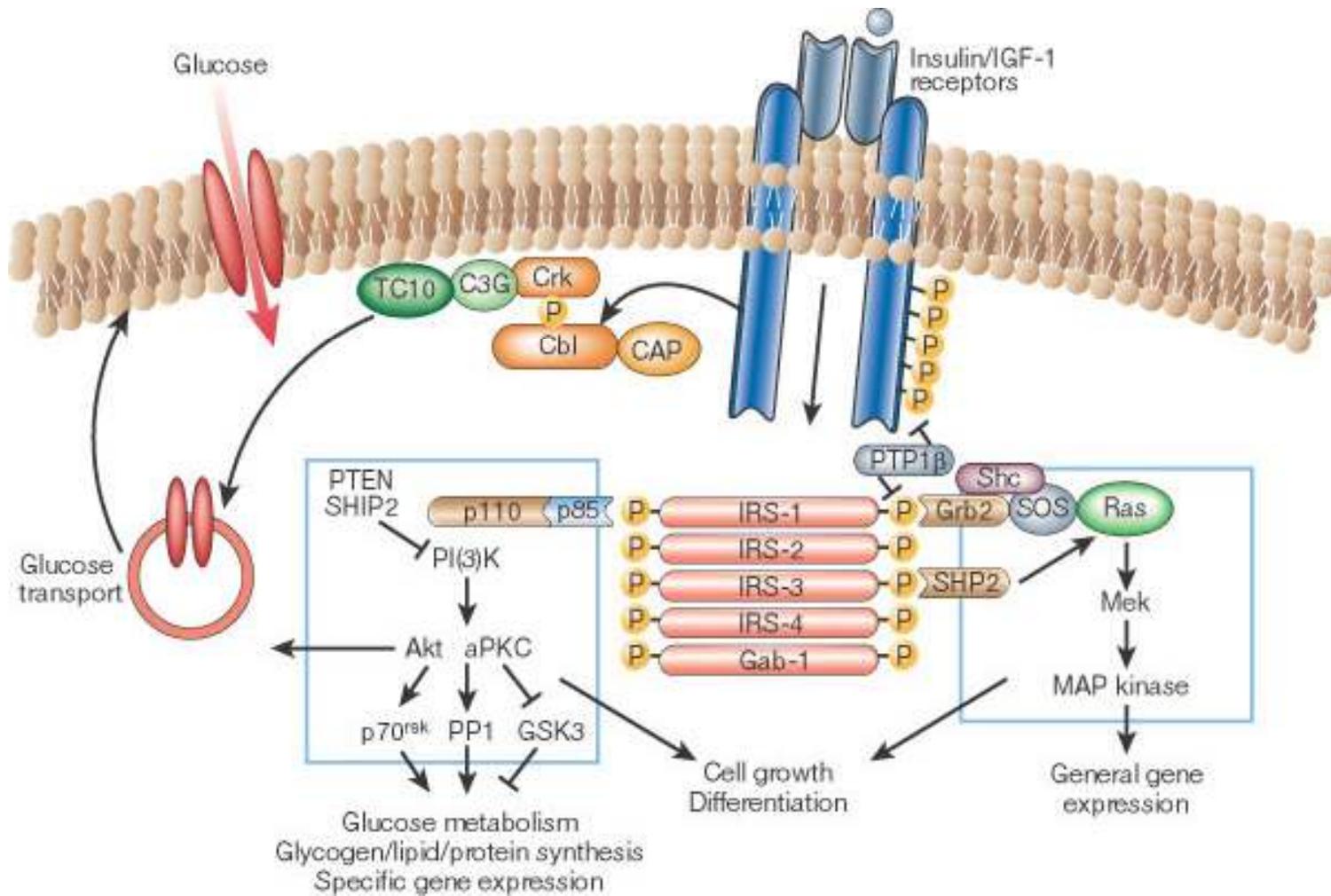
*DOCS Lecture Series*

# DIABETES PATHOPHYSIOLOGY

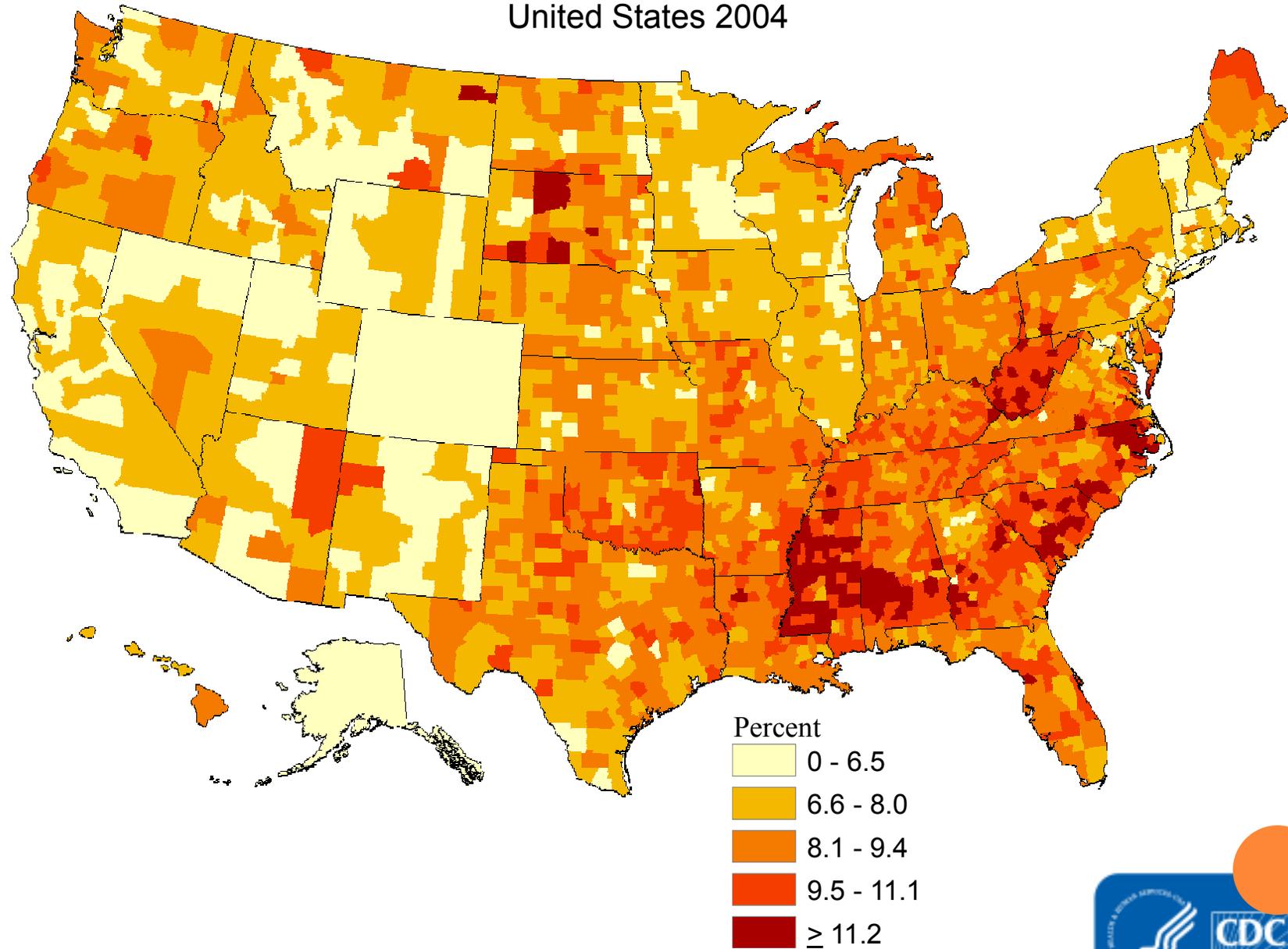
- Type 1: Autoimmune B-cell destruction leading to absolute insulin deficiency (usually <25 y.o.)
- Type 2: Insulin resistance with B-cell dysfunction leading to relative insulin deficiency



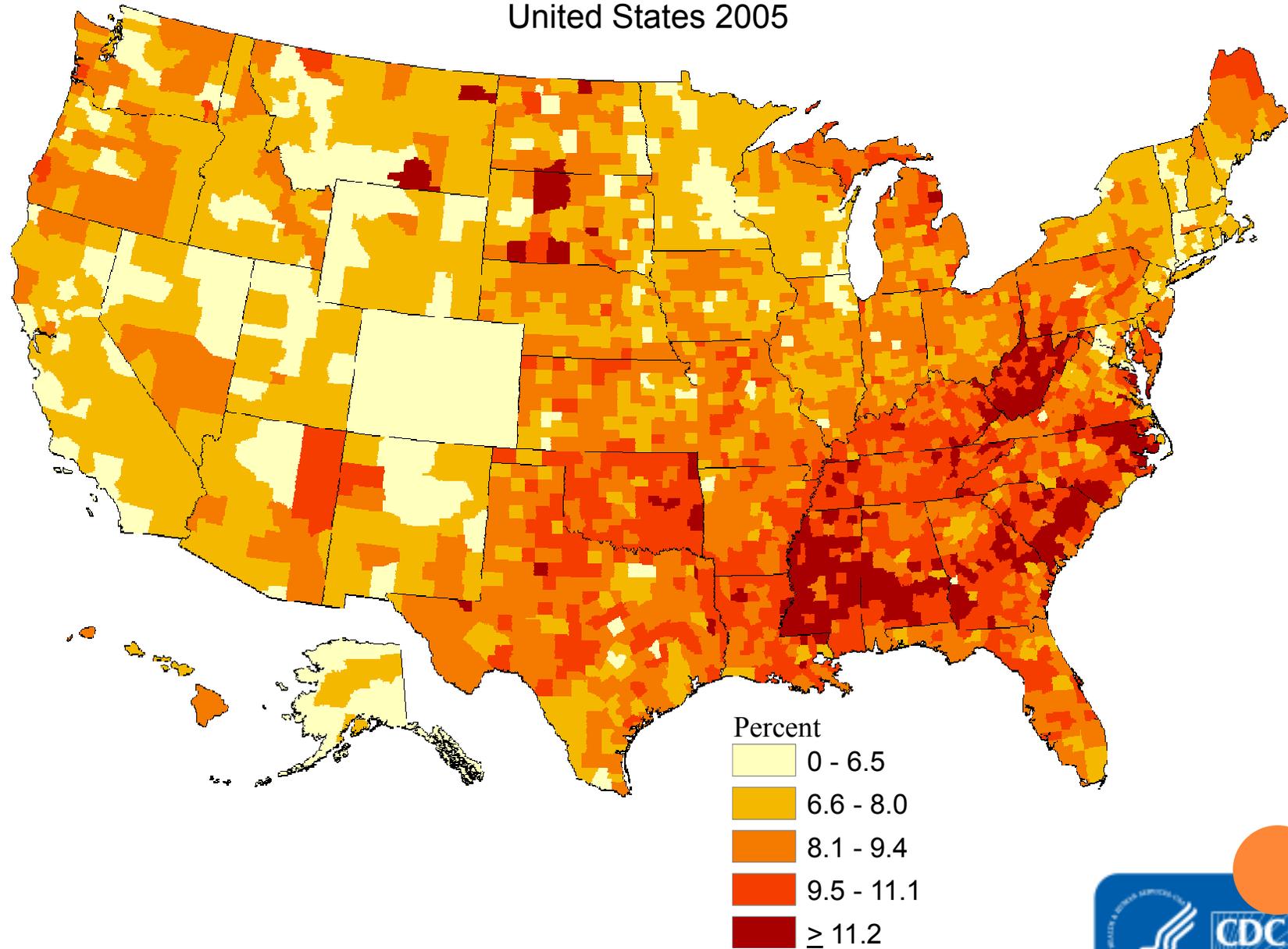
# INSULIN SIGNALING



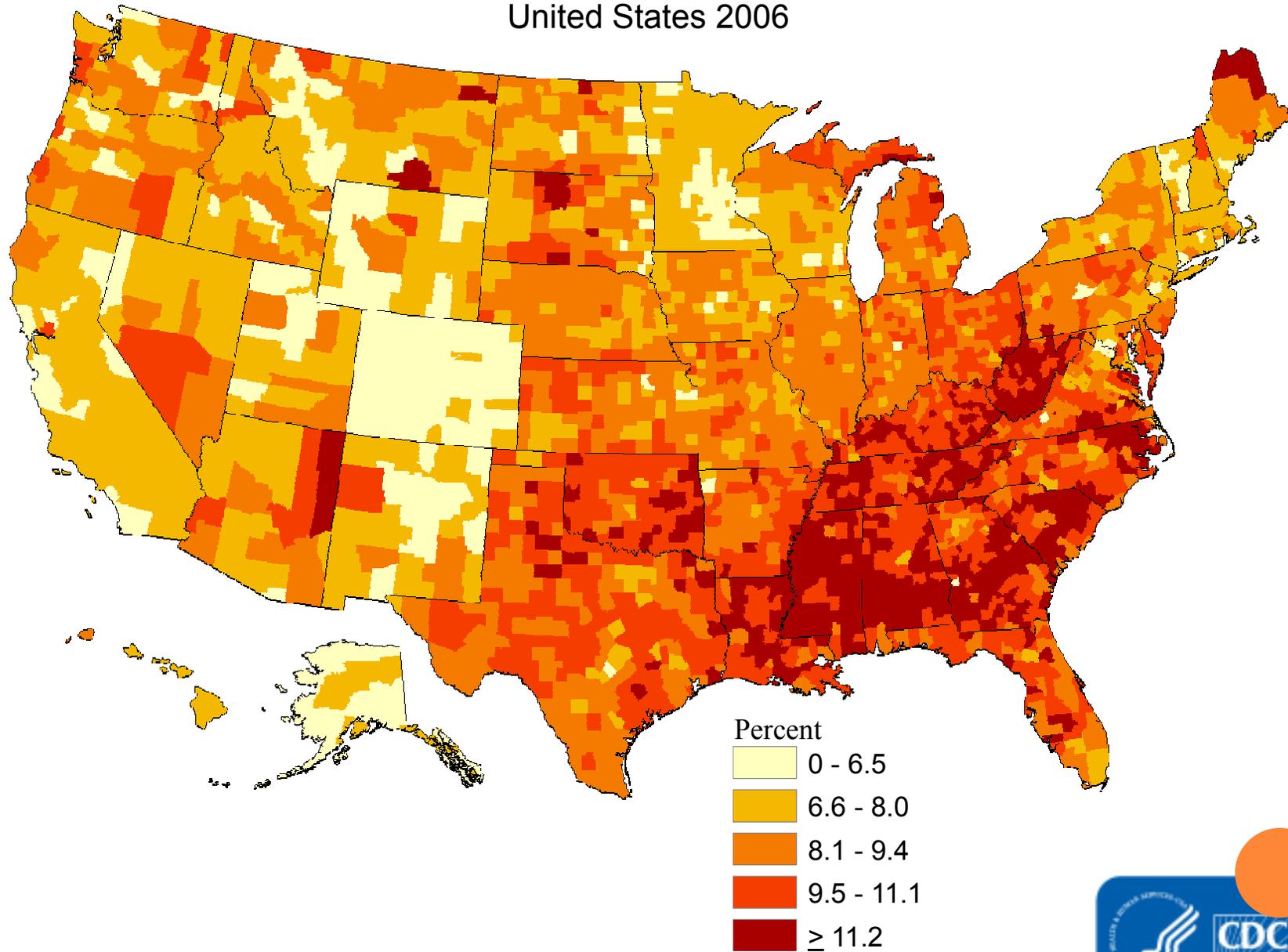
## County-level Estimates of Diagnosed Diabetes among Adults aged $\geq 20$ years: United States 2004



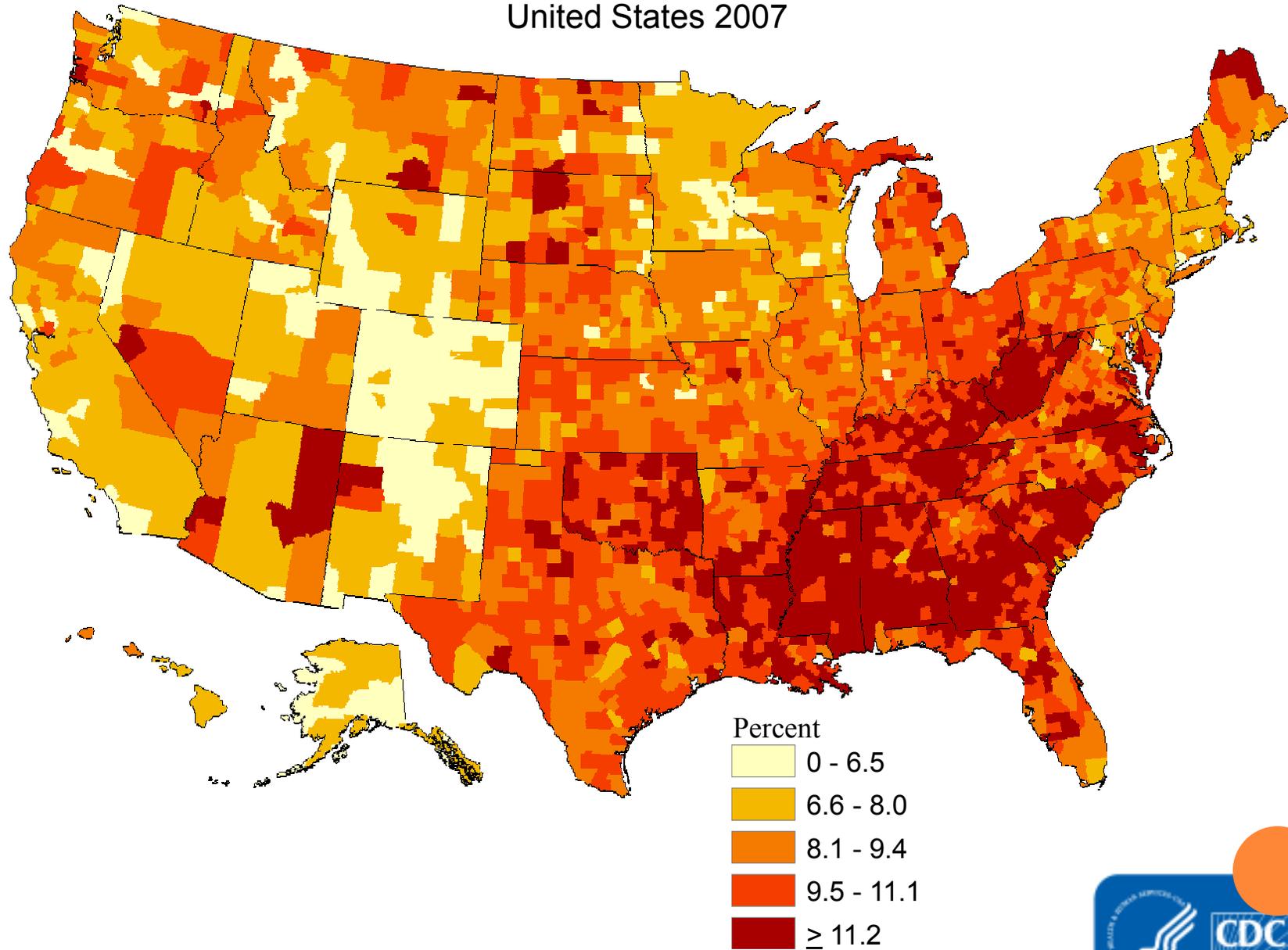
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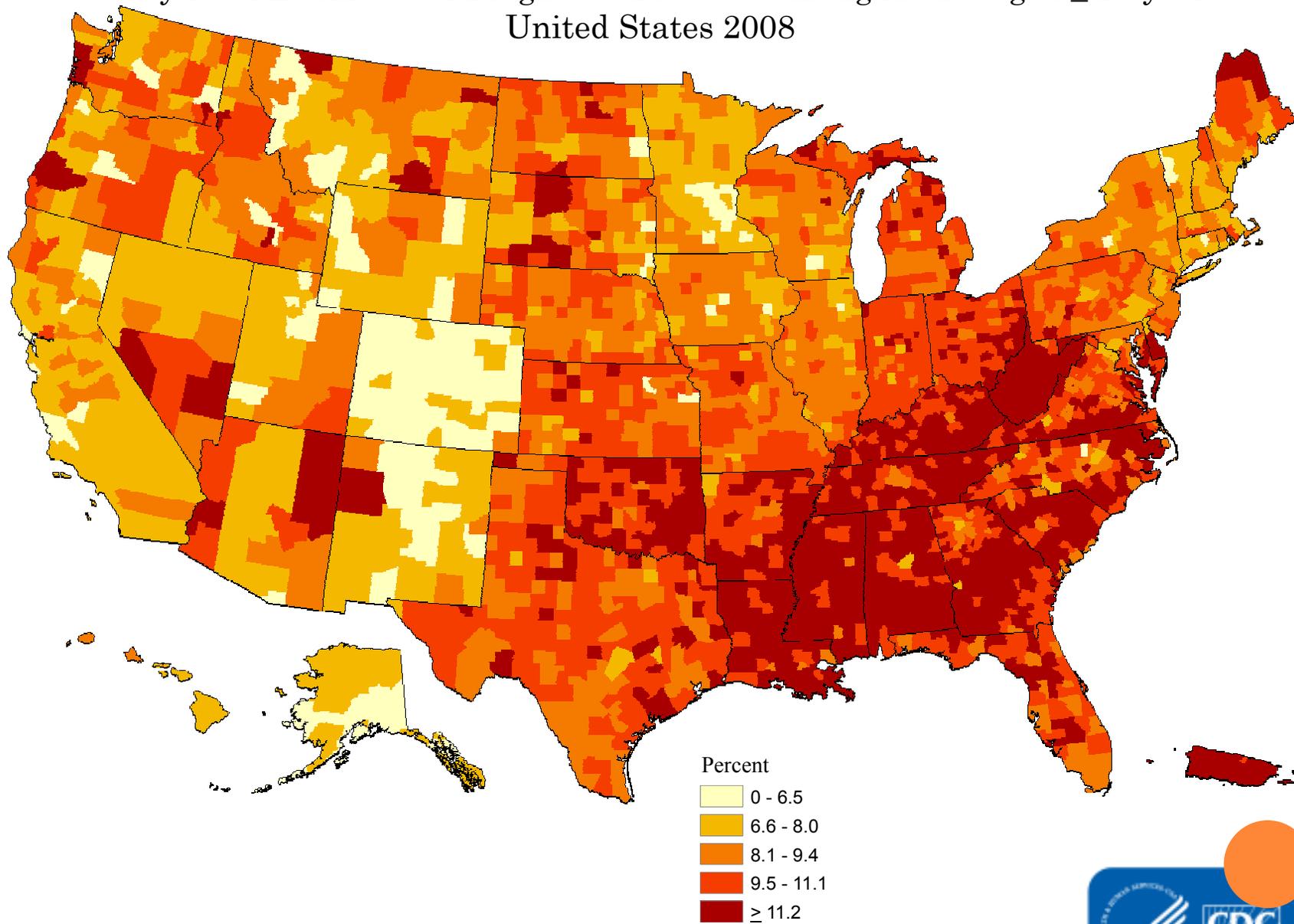
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## County-level Estimates of Diagnosed Diabetes among Adults aged $\geq 20$ years: United States 2007



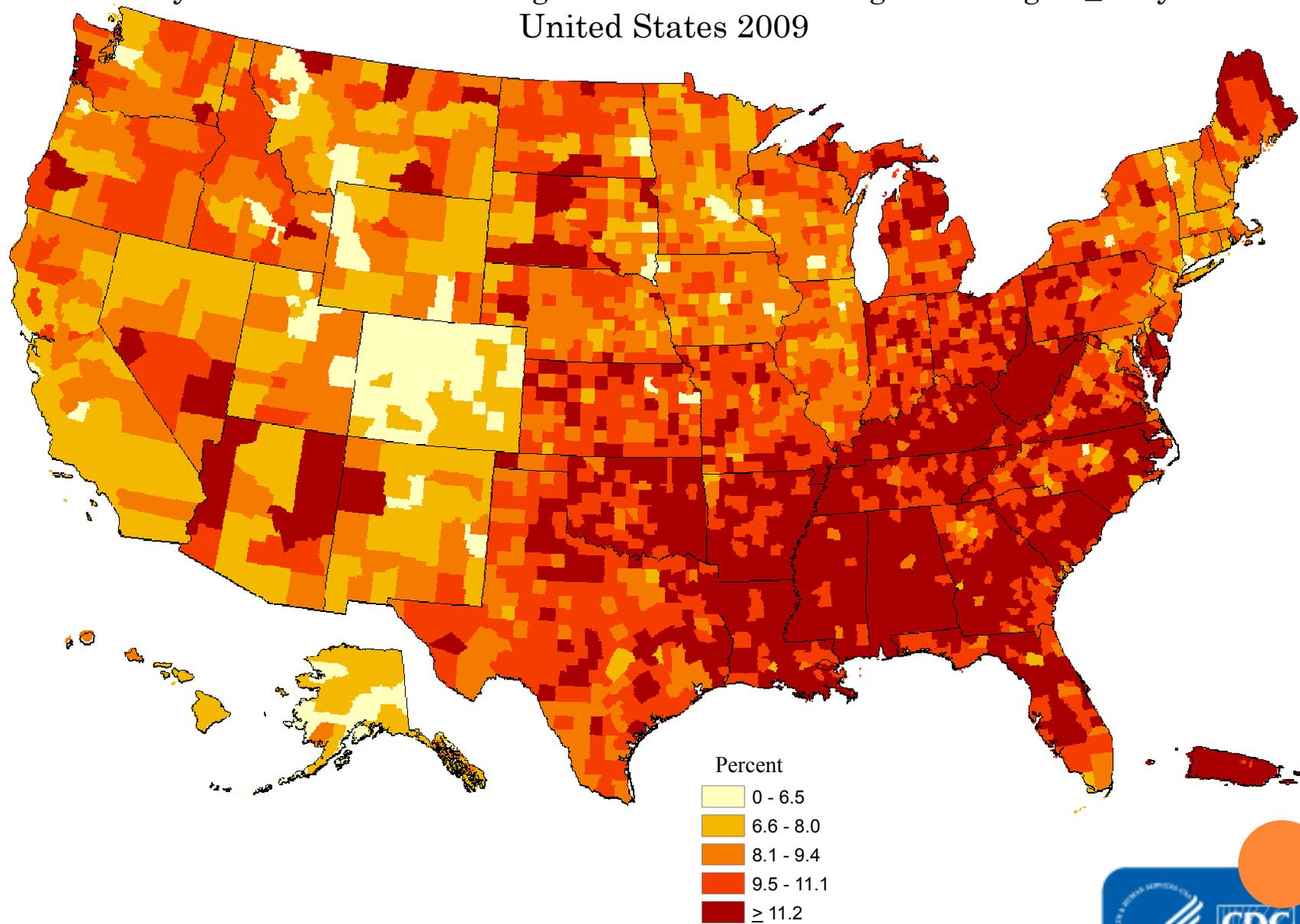
## County-level Estimates of Diagnosed Diabetes among Adults aged $\geq 20$ years: United States 2008



[www.cdc.gov/diabetes](http://www.cdc.gov/diabetes)



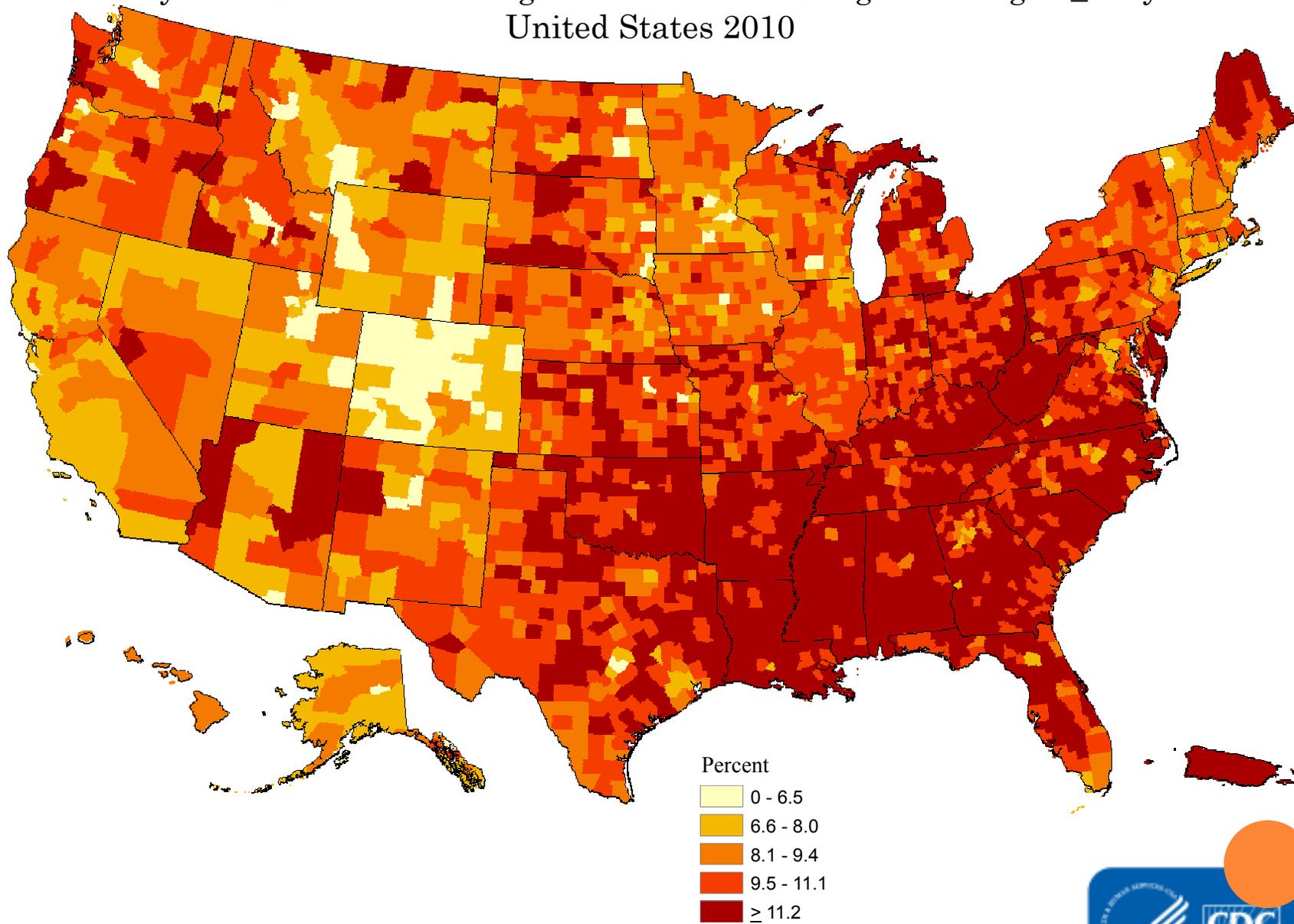
## County-level Estimates of Diagnosed Diabetes among Adults aged $\geq 20$ years: United States 2009



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## County-level Estimates of Diagnosed Diabetes among Adults aged $\geq 20$ years: United States 2010



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## **FAST FACTS ON DIABETES**

***Diabetes affects 25.8 million people  
8.3% of the U.S. population***

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**DIAGNOSED**  
***18.8 million people***

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**UNDIAGNOSED**  
***7.0 million people***

All ages, 2010



## POTENTIAL DIABETES

- You are working at checkout when a woman approaches your chair to leave
- She is Hispanic, obese, and after seeing her chart you see she is 51 y.o. and her glucose from the finger-stick is 180.
- Is she diabetic?



## DIAGNOSING DIABETES

- **Fasting plasma glucose > 126 mg/dL (7.0 mmol/L)** where fasting is defined as at least eight hours without food prior to the test. This needs to be confirmed by repeat testing on a different day.
- **A random blood sugar > 200 mg/dL (11.1 mmol/L)** accompanied by polyuria, polydipsia, or unexplained weight loss.
- **A blood sugar > 200 mg/dL (11.1 mmol/L), two hours following a 75 g glucose load** (the oral glucose tolerance test) confirmed by repeat testing on a different day. Although this is the gold standard for diagnosis of diabetes, it is expensive and time consuming and therefore rarely used.
- **Hemoglobin A1C greater than 6.5%**. (Hemoglobin A1C of 5.7%-6.4% defines patients at risk for future development of diabetes.)



## DIAGNOSING DIABETES

- **Impaired fasting glucose**, which is defined as a **fasting plasma glucose between 100-125 mg/dL (5.6-6.9 mmol/L)**.
- **Impaired glucose tolerance**, which is defined as a **two-hour postprandial glucose of 140-199 mg/dL (7.8-11.0 mmol/L)**.



# SCREENING GUIDELINES

## USPSTF :

- **Blood pressure greater than 135/80 mmHg.**
- Fasting blood glucose, OGTT, or hemoglobin A1c are all approved by USPSTF as screening tests, although fasting blood glucose is the least expensive and most convenient test.

## ADA :

- **BMI greater than 25 kg/m<sup>2</sup>.**
- **Any risk factors for diabetes**
- **If no risk factors are present, begin screening at **age 45** with **repeat testing every three years** in the absence of new risk factors.**



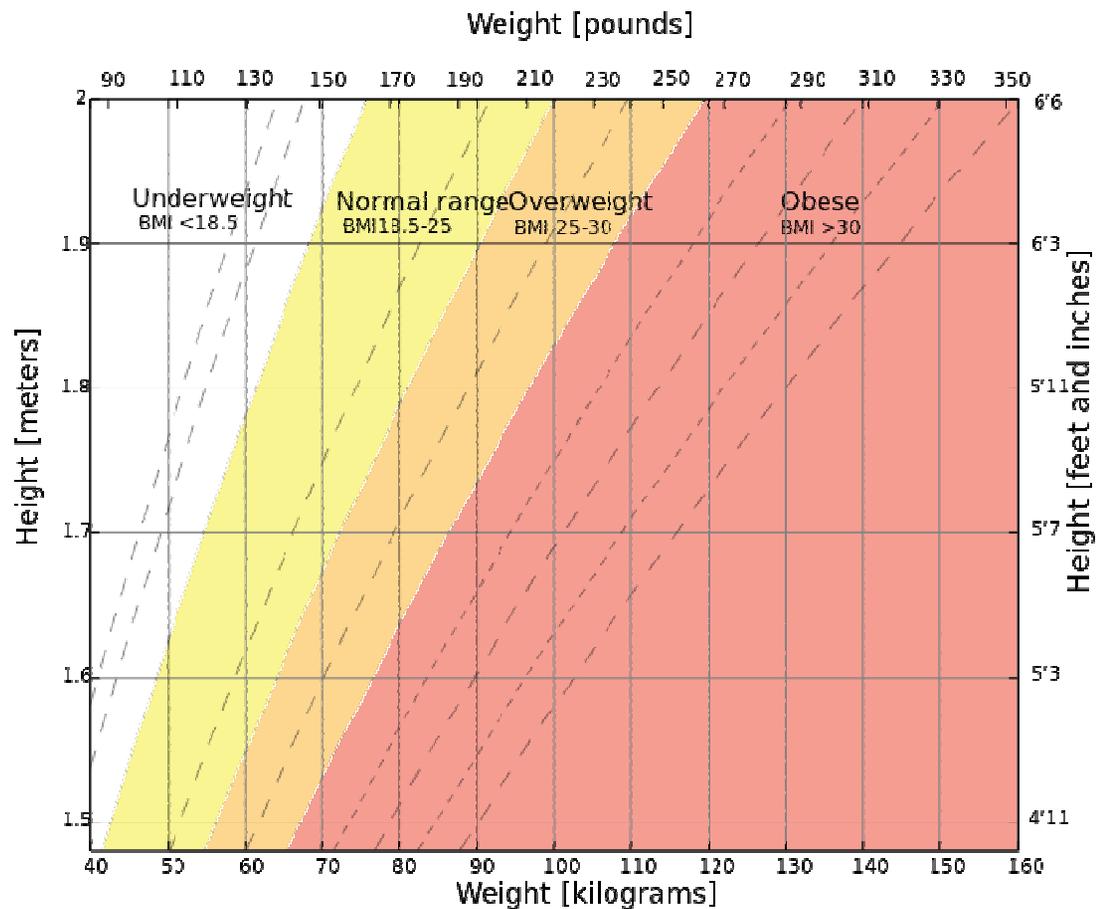
# RISK FACTORS FOR DIABETES

- **Age  $\geq 45$  years**
- Family history diabetes mellitus in a first-degree relative
- Sedentary lifestyle
- **Obesity**
- Diet high in sugar
- Belonging to a high-risk ethnic or racial group (e.g. African-American, **Hispanic**, Native American, Asian-American, and Pacific Islander)
- History of delivering a baby weighing  $>4.1$  kg (9 lb) or of gestational diabetes mellitus
- Hypertension (BP  $\geq 140/90$  mmHg)
- Dyslipidemia (HDL  $\leq 35$  mg/dL (0.9 mmol/L) and/or a serum triglyceride concentration  $\geq 250$  mg/dL (2.8 mmol/L))
- Previously identified impaired glucose tolerance or impaired fasting glucose
- Polycystic ovary syndrome
- History of vascular disease



# BMI

$$= \frac{\text{mass}(\text{kg})}{(\text{height}(\text{m}))^2} = \frac{\text{mass}(\text{lb})}{(\text{height}(\text{in}))^2} \times 703$$



# SYMPTOMS OF DIABETES

- frequent urination
- unusual thirst
- extreme hunger
- unusual weight loss
- extreme fatigue and irritability
- frequent infections
- blurred vision
- cuts/bruises that are slow to heal
- tingling/numbness in the hands/feet
- recurring infections



# CAN'T DIAGNOSE PATIENT SO NOW WHAT?

- First and foremost - diet and exercise
  - either weight training or aerobic exercise for at least 150 minutes per week (Diabetes Prevention Program (DPP) reducing weight by 7 percent in overweight, impaired-glucose-tolerance individuals had RRR >50% at 3 years)
- Refer to PCP for
  - Additional glucose tests (for diagnosis)
  - HbA1C
  - Disease management



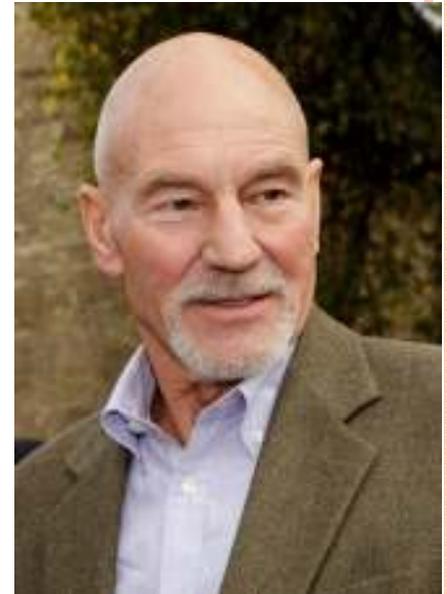
# POTENTIAL COMPLICATIONS OF DIABETES

- Heart Disease and Stroke
- Blindness and eye problems
- Kidney disease
- Neuropathies
- Amputations



# CHOLESTEROL

- You are working at checkout when a man approaches your chair to leave
- After reading his chart you see he is 65 y.o. with a BP reading of 150/85.
- He tells you he has high BP before and has had high cholesterol in the past.
- What do you tell him?



# CHOLESTEROL LEVEL CONTRIBUTES TO CORONARY HEART DISEASE EVENT RISK

- Framingham Study Supplied data
- 10 year risk of >20% is CHD equivalent
- Cholesterol level used in Framingham point system
- Cholesterol is a modifiable variable to treat



## SCREENING/DIAGNOSIS FOR DYSLIPIDEMIA

- Most dyslipidemia is hyperlipidemia
- Initiate at 20-35 y.o. M and 20-40 in F
- Screen every 5 years if lipids normal, average risk
- More frequent in higher risk
- Need 2 measurements at least 1 week apart for diagnosis



## ATP III Classification of LDL, Total, and HDL Cholesterol (mg/dL)

### LDL Cholesterol – Primary Target of Therapy

<100	Optimal
100-129	Near optimal/above optimal
130-159	Borderline high
160-189	High
≥190	Very high

### Total Cholesterol

<200	Desirable
200-239	Borderline high
≥240	High

### HDL Cholesterol

<40	Low
≥60	High

## ATP III Classification of Serum Triglycerides (mg/dL)

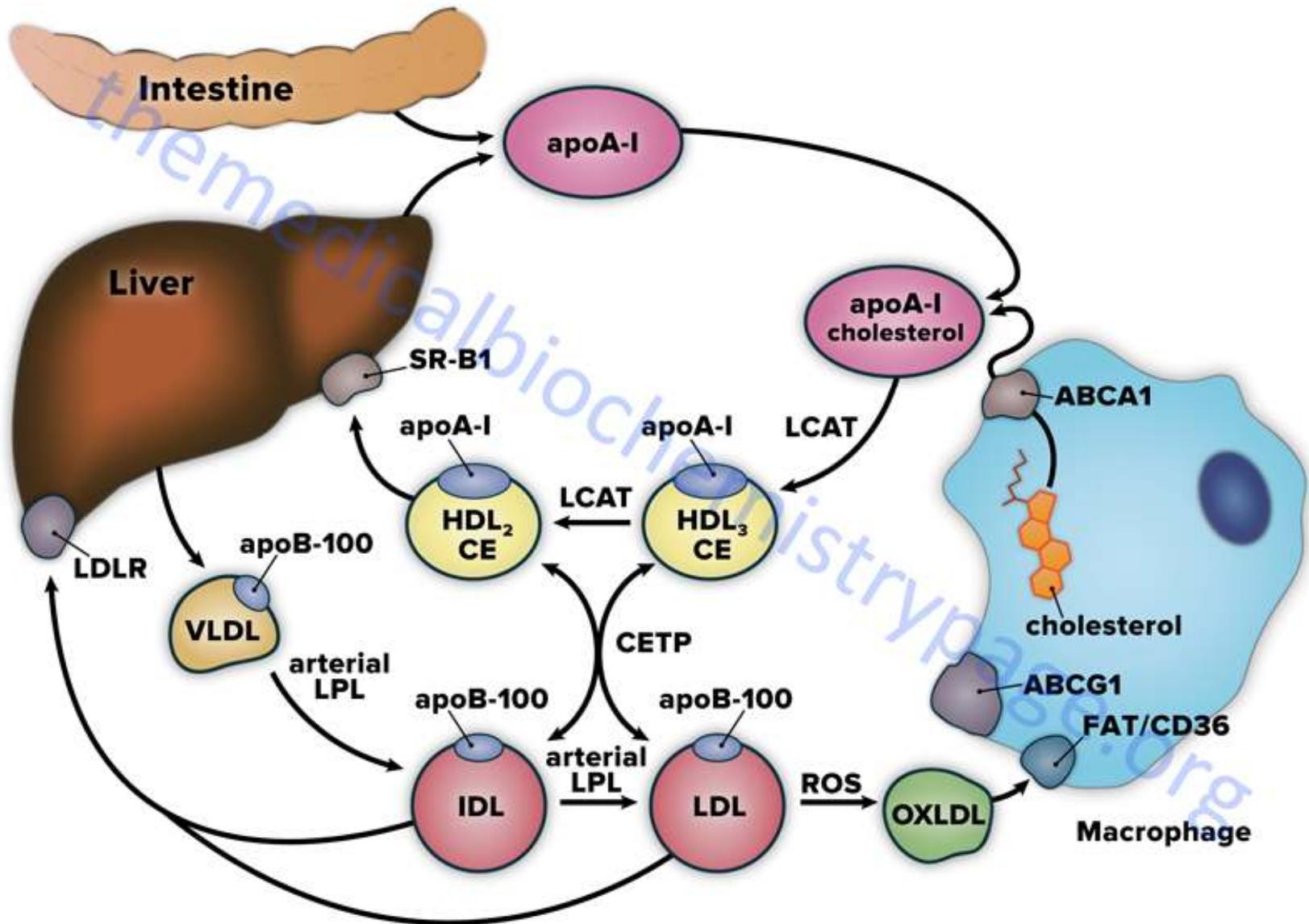
<150	Normal
150-199	Borderline high
200-499	High
≥500	Very high

$$\text{LDL} = \text{TotChol} - \text{HDL} - (\text{TRIG}/5)$$

FRIEDEWALD FORMULA



# CHOLESTEROL TRANSPORT



## RISK FACTORS EQUIVALENT TO CHD

- CHD equivalents, that is, risk factors that place the patient at similar risk for CHD events as a history of CHD itself, are identified:
  - Diabetes mellitus
  - Symptomatic carotid artery disease
  - Peripheral artery disease
  - Abdominal aortic aneurysm
  - Multiple risk factors that confer a 10-year risk of CHD >20 percent



# MAJOR RISK FACTORS OF CHD

Major CHD factors other than LDL are identified:

- Cigarette smoking
- **Hypertension** (BP  $\geq$ 140/90 or antihypertensive medication)
- Low HDL-cholesterol (HDL-C) (<40 mg/dL [1.03 mmol/L])
- Family history of premature CHD (in male first degree relatives <55 years, in female first degree relative <65 years)
- **Age** (men  $\geq$ 45 years, women  $\geq$ 55 years)
- HDL-C  $\geq$ 60 mg/dL (1.55 mmol/L) counts as a "negative" risk factor; its presence removes one risk factor from the total count.



# Men

## Estimate of 10-Year Risk for Men

(Framingham Point Scores)

Age	Points
20-34	-9
35-39	-4
40-44	0
45-49	3
50-54	6
55-59	8
60-64	10
65-69	11
70-74	12
75-79	13

Total Cholesterol	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
<160	0	0	0	0	0
160-199	4	3	2	1	0
200-239	7	5	3	1	0
240-279	9	6	4	2	1
≥280	11	8	5	3	1

	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
Non-smoker	0	0	0	0	0
Smoker	0	5	3	1	1

HDL (mg/dL)	Points
≥60	-1
50-59	0
40-49	1
<40	2

Systolic BP (mmHg)	If Untreated	If Treated
<120	0	0
120-129	0	1
130-139	1	2
140-159	1	2
≥160	2	3

Point Total	10-Year Risk %
<0	< 1
0	1
1	1
2	1
3	1
4	1
5	2
6	2
7	3
8	4
9	5
10	6
11	8
12	10
13	12
14	16
15	20
16	25
≥17	≥ 30

10-Year risk \_\_\_\_\_%

# Women

## Estimate of 10-Year Risk for Women

(Framingham Point Scores)

Age	Points
20-34	-7
35-39	-3
40-44	0
45-49	3
50-54	6
55-59	8
60-64	10
65-69	12
70-74	14
75-79	16

Total Cholesterol	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
<160	0	0	0	0	0
160-199	4	3	2	1	1
200-239	8	6	4	2	1
240-279	11	8	5	3	2
≥280	13	10	7	4	2

	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
Non-smoker	0	0	0	0	0
Smoker	0	7	4	2	1

HDL (mg/dL)	Points
≥60	-1
50-59	0
40-49	1
<40	2

Systolic BP (mmHg)	If Untreated	If Treated
<120	0	0
120-129	1	3
130-139	2	4
140-159	3	5
≥160	4	6

Point Total	10-Year Risk %
< 9	< 1
9	1
10	1
11	1
12	1
13	2
14	2
15	3
16	4
17	5
18	6
19	8
20	11
21	14
22	17
23	22
24	27
≥25	≥ 30

10-Year risk \_\_\_\_\_%



# WHAT CAN YOU TELL A PATIENT TO DO FOR HIGH CHOLESTEROL

## Lifestyle Changes

- Saturated fat <7% of calories, cholesterol <200 mg/day
- Consider increase viscous (soluble) fiber (10-25 g/day) and plant stanol/sterols (2g/day) as option
- Weight management (2% reduction => 7% reduction in total and LDL lvl)
- Increased physical activity with diet changes (up to 20 pt reduction)



# OTHER TREATMENTS OF HYPERLIPIDEMIA

## Drug Therapy

- Statins
- Bile acid sequestrants
- Nicotinic acid
- fibric acids



## REFERENCES

- <http://themedicalbiochemistrypage.org/lipoproteins.php>
- Dr. Goldberg Lipid Transport Lecture
- Uptodate
- <http://www.cdc.gov/diabetes/>



THANK YOU!

