Diabetes – A Rising Public Health Challenge

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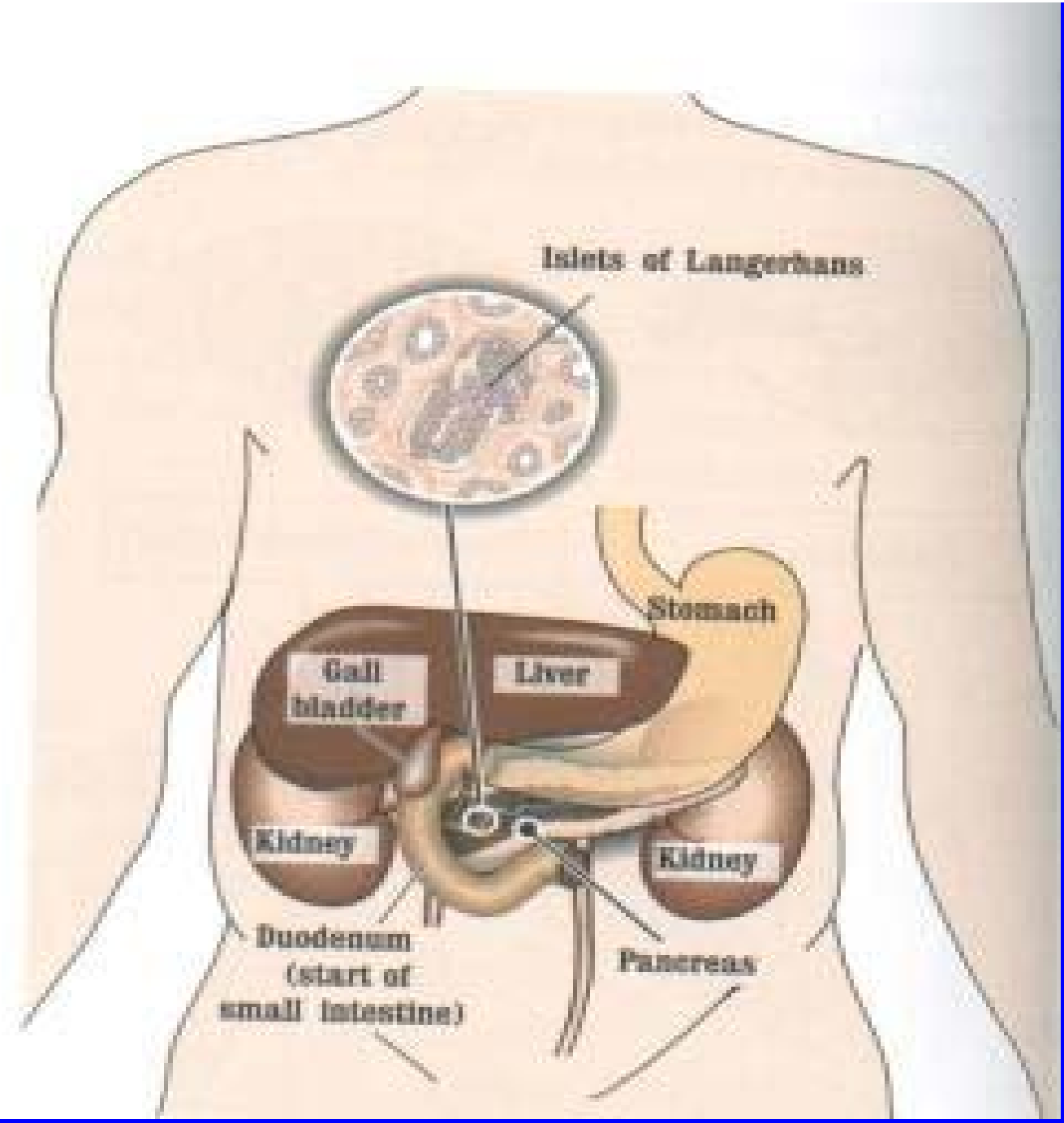
Diabetes

- A disease in which the body does not produce or properly use insulin

- Insulin
  - Is a protein hormone synthesized in the pancreas by the beta cells of the islets of Langerhans
  - is essential for the metabolism of carbohydrates, lipids, and proteins

Insulin

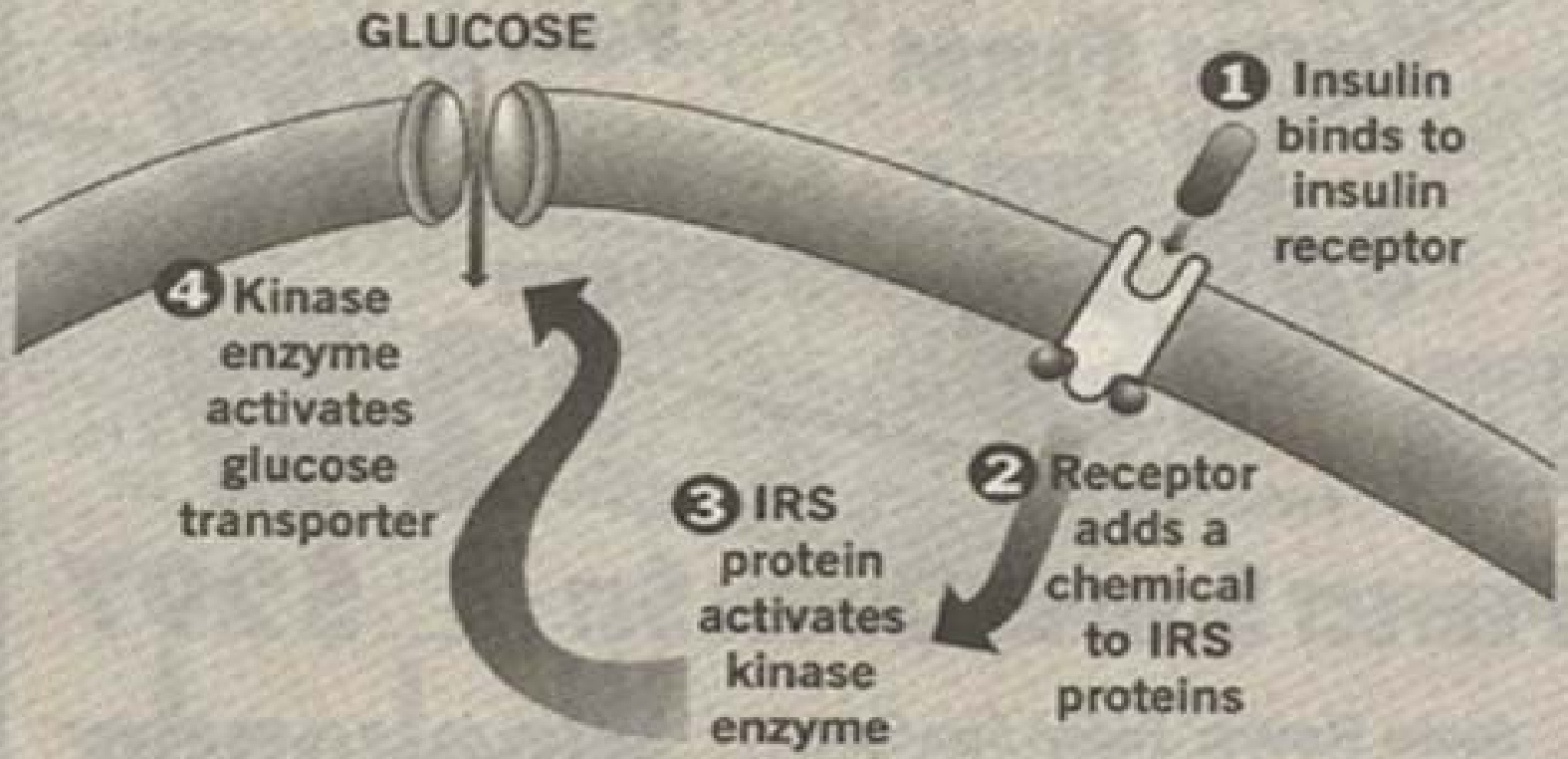
- regulates blood sugar levels
  - by facilitating the uptake of glucose into tissues
  - by promoting its conversion into glycogen, fatty acids, and triglycerides
  - by reducing the release of glucose from the liver



JULY 21, 2000

Insulin's role in transporting glucose

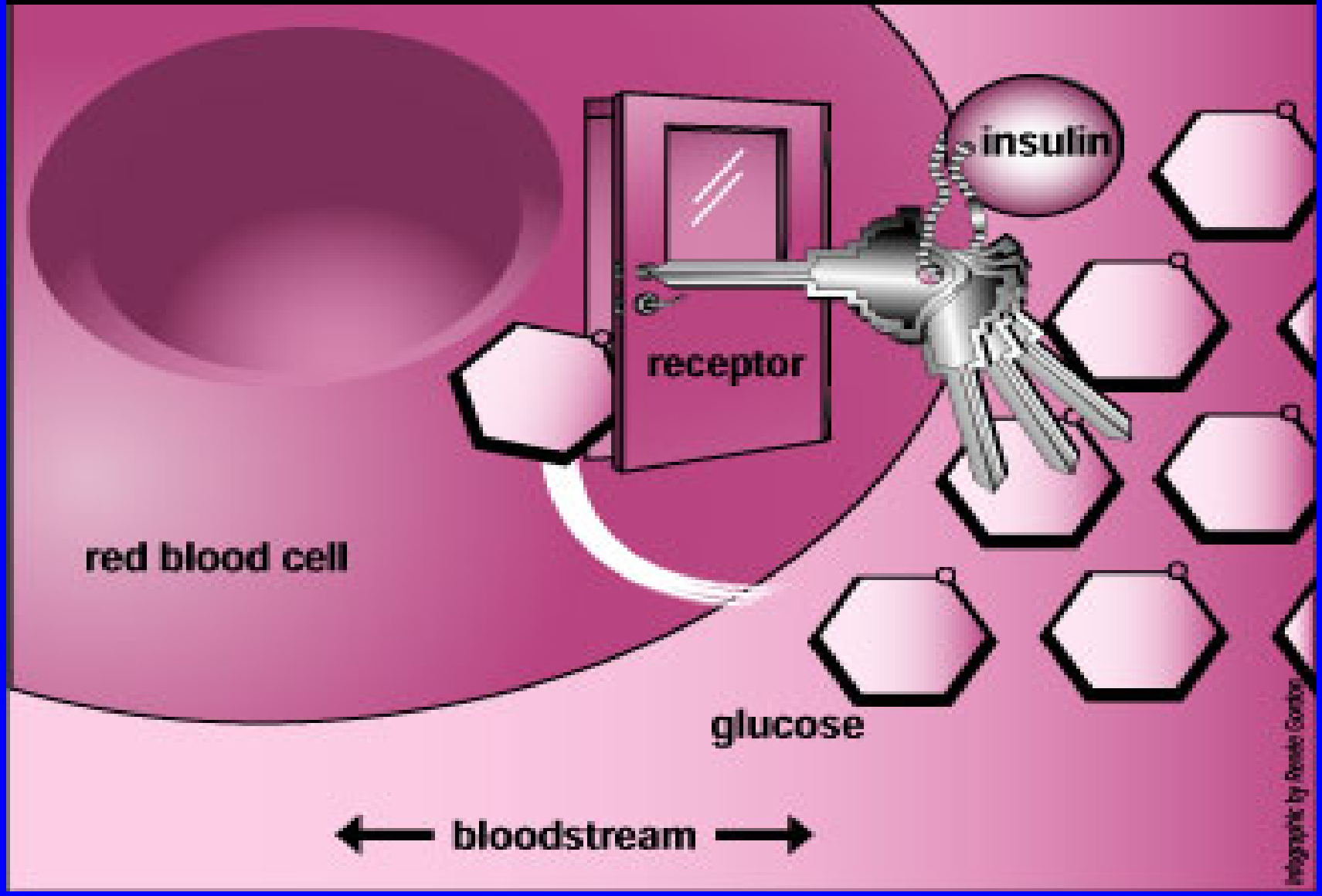
The binding of insulin to its receptor triggers a four-step signaling pathway within the cell. A defect at any of the four steps can produce diabetes. Juvenile diabetes results from a lack of insulin, subverting step 1 of the pathway. Current attempts to cure type 2 diabetes are focused on step 2, although defects in steps 3 and 4 have not been ruled out.



Source: G. Johnson

POST-DISPATCH

The Role of Insulin



(Source: Christopher D. Saudek, Richard R. Rubin, and Cynthia S. Shump. *The Johns Hopkins Guide to Diabetes.* Baltimore: The Johns Hopkins University Press, 1997.)

Type 1 Diabetes

- Beta-cell destruction (autoimmune or idiopathy)
- Absolute deficiency of insulin that leads to
  - Hyperglycemia
  - Marked tendency toward ketoacidosis
- Can occur at any age, but commonly < 30 yrs

Type 1 Diabetes

- Affects 5-10% of Americans with diabetes
- Symptoms
  - Increased thirst and urination
  - Constant hunger
  - Weight loss
  - Blurred vision
  - Extreme fatigue
  - Diabetic coma

Type 2 Diabetes

- Insulin resistance with relative insulin deficiency $\longrightarrow$ predominantly an insulin secretory defect with insulin resistance
- Affects 90-95% of people with diabetes
- Usually occurs after age 30
- Relatively few classic symptoms of diabetes

Type 2 Diabetes

- Little likelihood of diabetic ketoacidosis
- Is more common among African Americans, Native Americans, Hispanics, Asians, and Pacific Islanders.
- About 50% of men and 70% of women with type 2 diaibetes are obese

Gestational Diabetes (GDM)

- Glucose intolerance first detected during pregnancy
- Affects about 4% of all pregnant women
  - About 135,000 cases of GDM in the US each year

Gestational Diabetes

- Risk to mothers
  - Short term
    - Caesarean section
    - Urinary tract infection
    - High blood pressure during pregnancy
  - Long term
    - Type 2 diabetes

Gestational Diabetes

- Risk to children
  - Short term
    - Macrosomia
    - Shoulder dystocia
    - Neonatal hypoglycemia
    - Neonatal low blood calcium
    - Neonatal respiratory distress syndrome
  - Long term
    - Childhood obesity
    - Adulthood diabetes

Diagnosis of Diabetes

- Symptoms + casual plasma glucose ≥ 200mg/dl, or
- FPG ≥ 126 mg/dl, or
- 2-h postload glucose ≥ 200 mg/dl during an OGTT

* OGTT: WHO method, 75 g glucose load
* In the absence of unequivocal hyperglycemia, these criteria should be confirmed by repeat testing on a different day.
* OGTT is not recommended for routine clinical use.

Diagnosis of GDM

- 100-g Glucose load
  - Fasting 95 mg/dl
  - 1 h 180 mg/dl
  - 2 h 155 mg/dl
  - 3 h 140 mg/dl

- 75-g Glucose load
  - Fasting 95 mg/dl
  - 1h 180 mg/dl
  - 2h 155 mg/dl

• 2+ venous plasma concentration must be met or exceeded.
•The test should be done in the morning after an overnight fast of 8-14 h and
•After at least 3 days of unrestricted diet (≥ 150 g CHO per day) and
•Unlimited physical activity.
•The subject should be remain seated and should not smoke throughout the test.

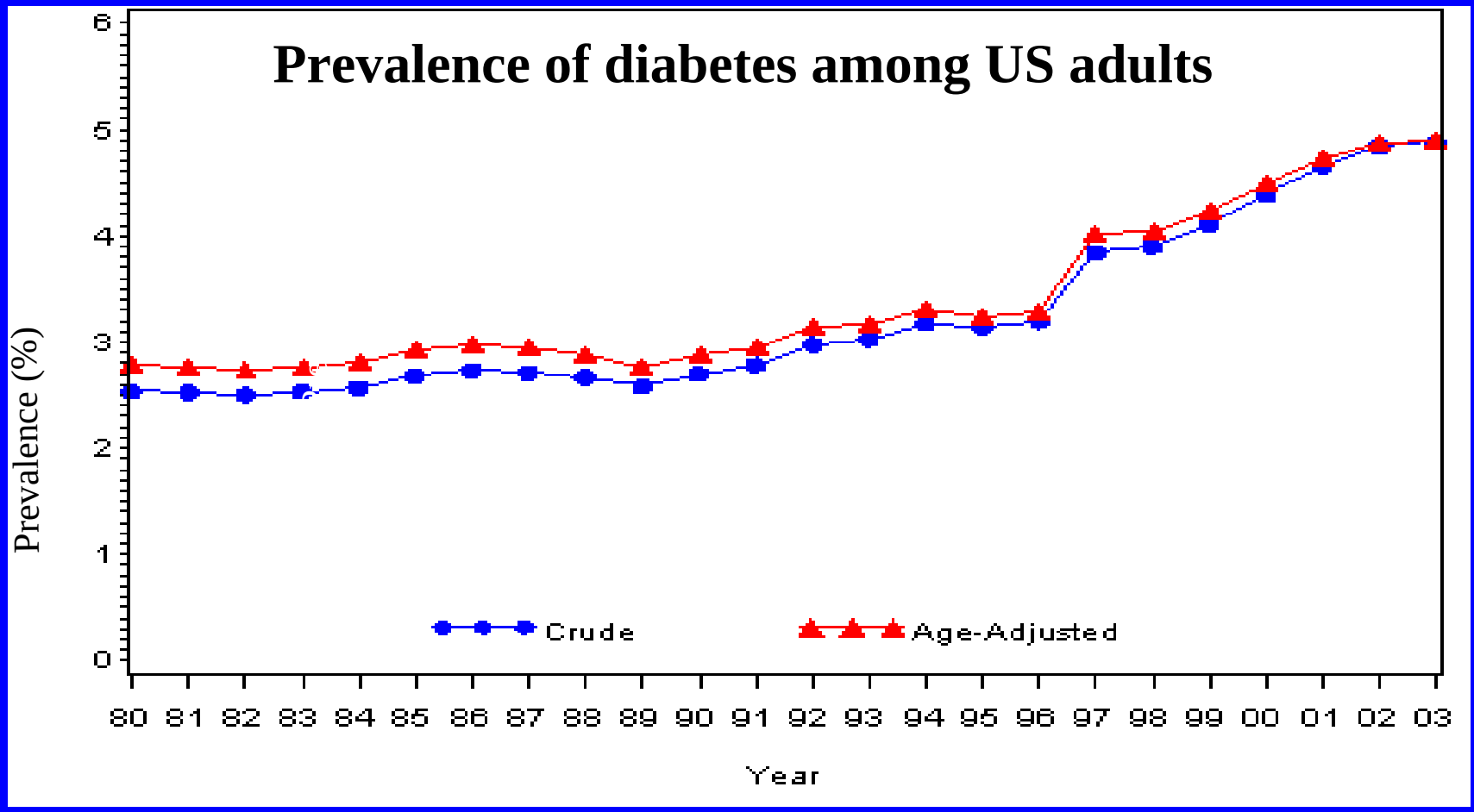
Prediabetes (PD)

- Blood glucose levels: normal < PD < Type 2 diabetes
  - Impaired fasting glucose (IFG)
    - Fasting plasma glucose: 100 to 125 mg/dl.
  - Impaired glucose tolerance (IGT)
    - Glucose level: 140 to 199 mg/dl, 2 hours after 75g of glucose.

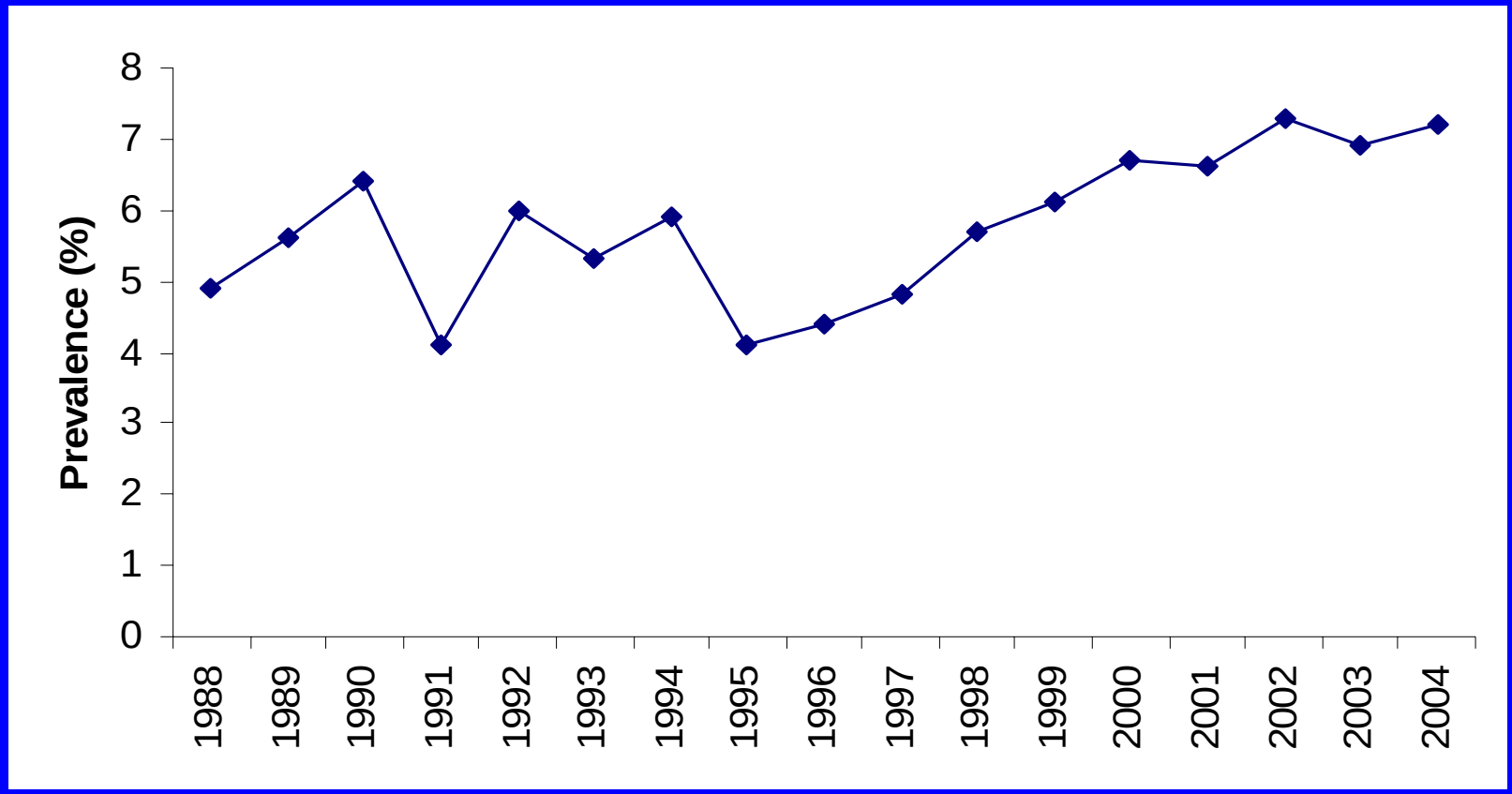
Prediabetes (PD)

- Persons with PD are at increased risk for the development of
  - Diabetes
  - Other adverse health outcomes, such as heart diseases and stroke
- Progression to diabetes can be prevented or delayed by
  - Increasing physical activity
  - Losing weight
  - Taking medication

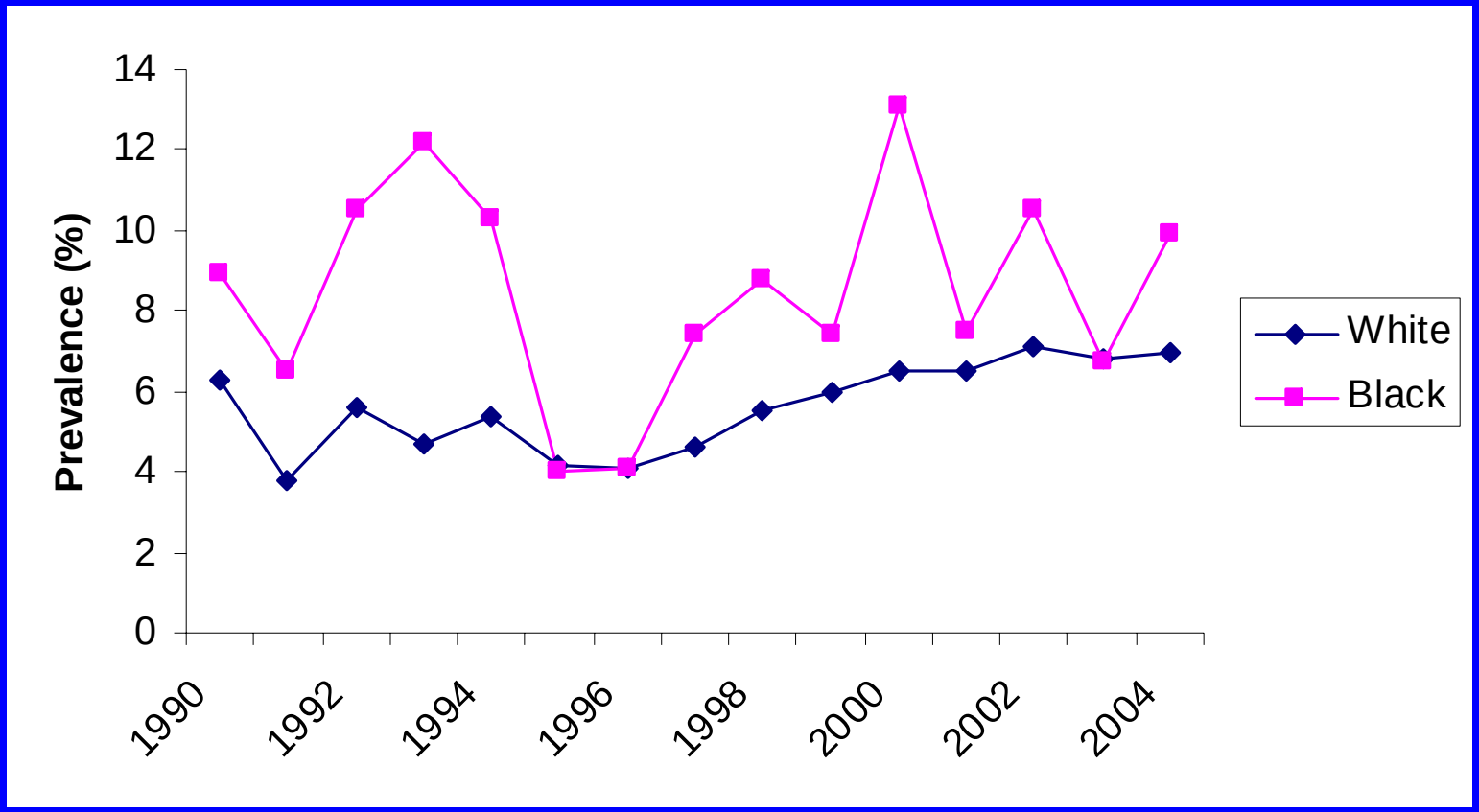
Diabetes Is on the Rise



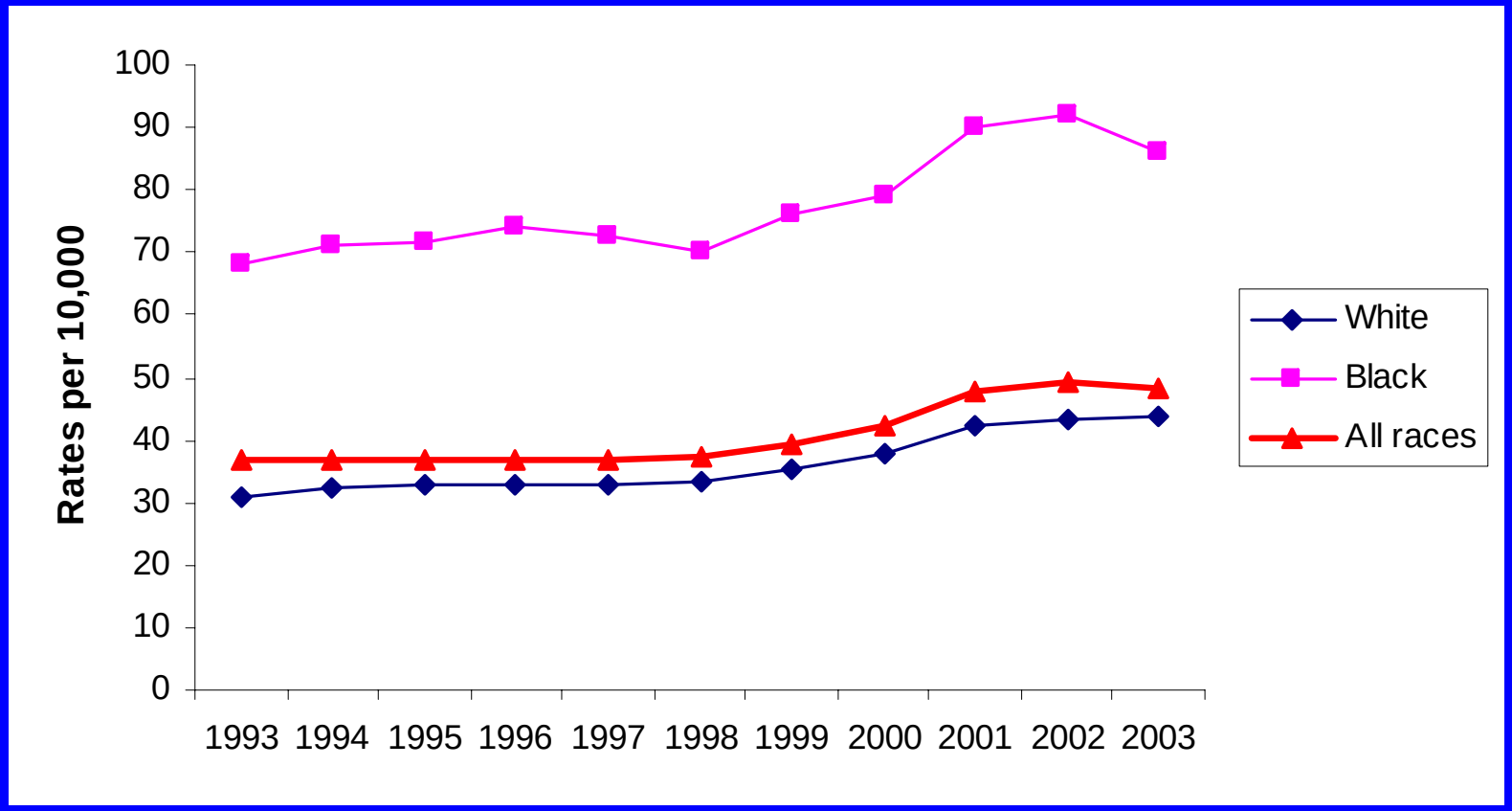
Prevalence of Self-Reported Physician Diagnosed Diabetes in Missouri, 1988-2004



Diabetes Prevalence Among Adults in Missouri, by Races, 1990-2004

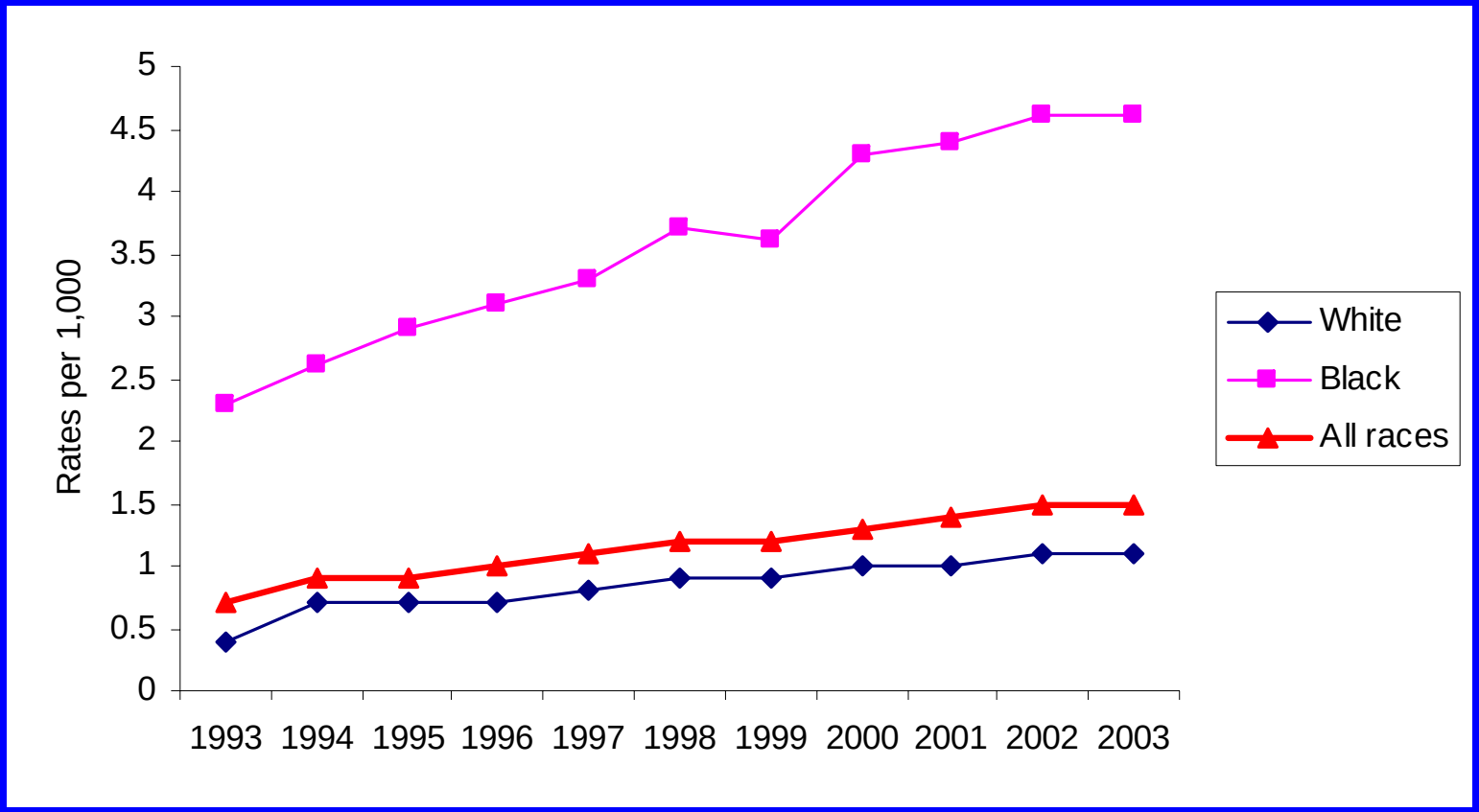


Diabetes Hospitalization Rates* in Missouri, 1993-2003



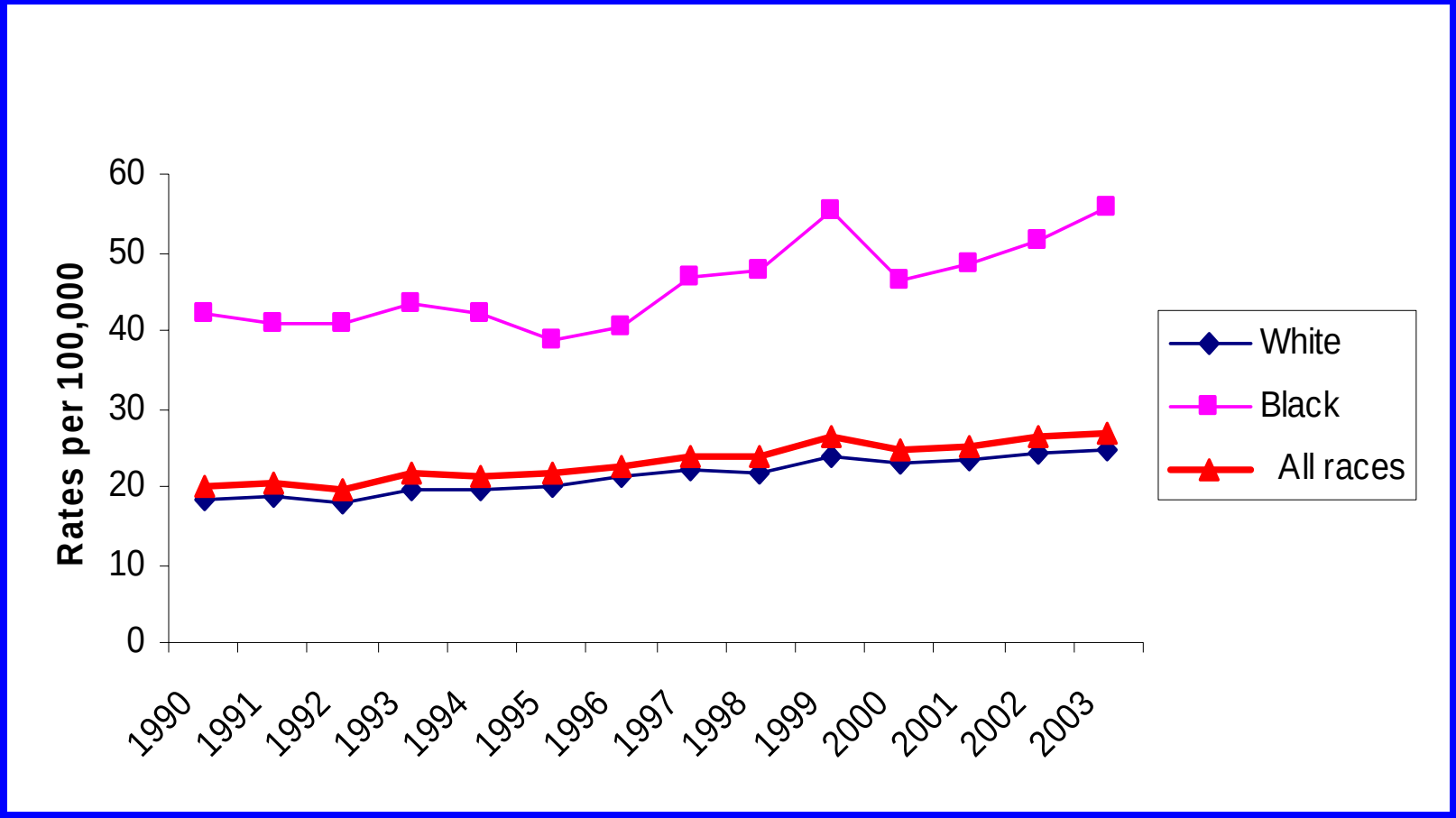
* Diabetes as the principal diagnosis

Diabetes Emergency Room Visit Rates* in Missouri, 1993-2003



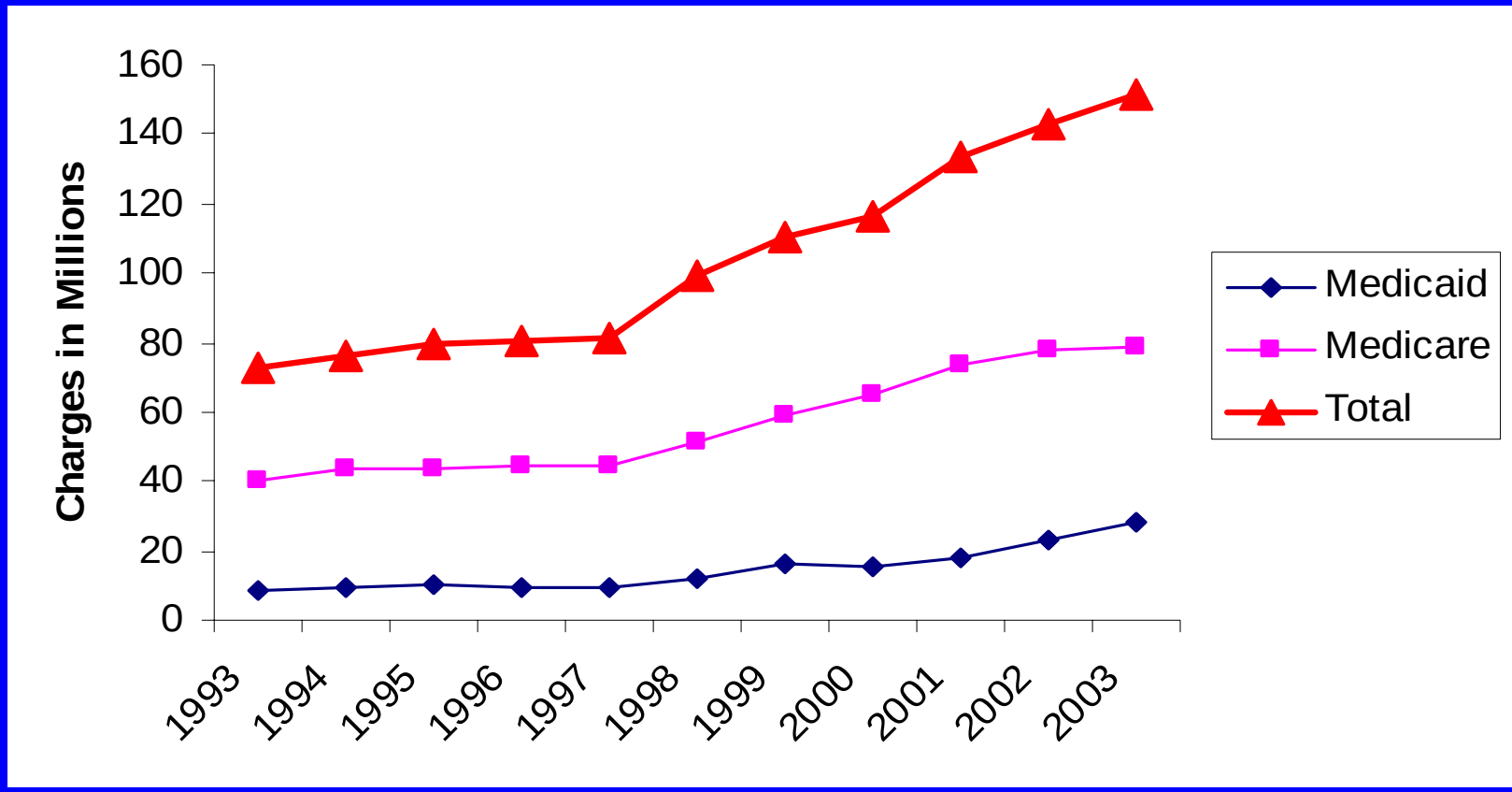
* Diabetes as the principal diagnosis

Diabetes Mortality Rates* in Missouri, 1990-2003



* Diabetes as the underlying cause of death

Diabetes Inpatient Hospital Charges* in Missouri, 1993-2003



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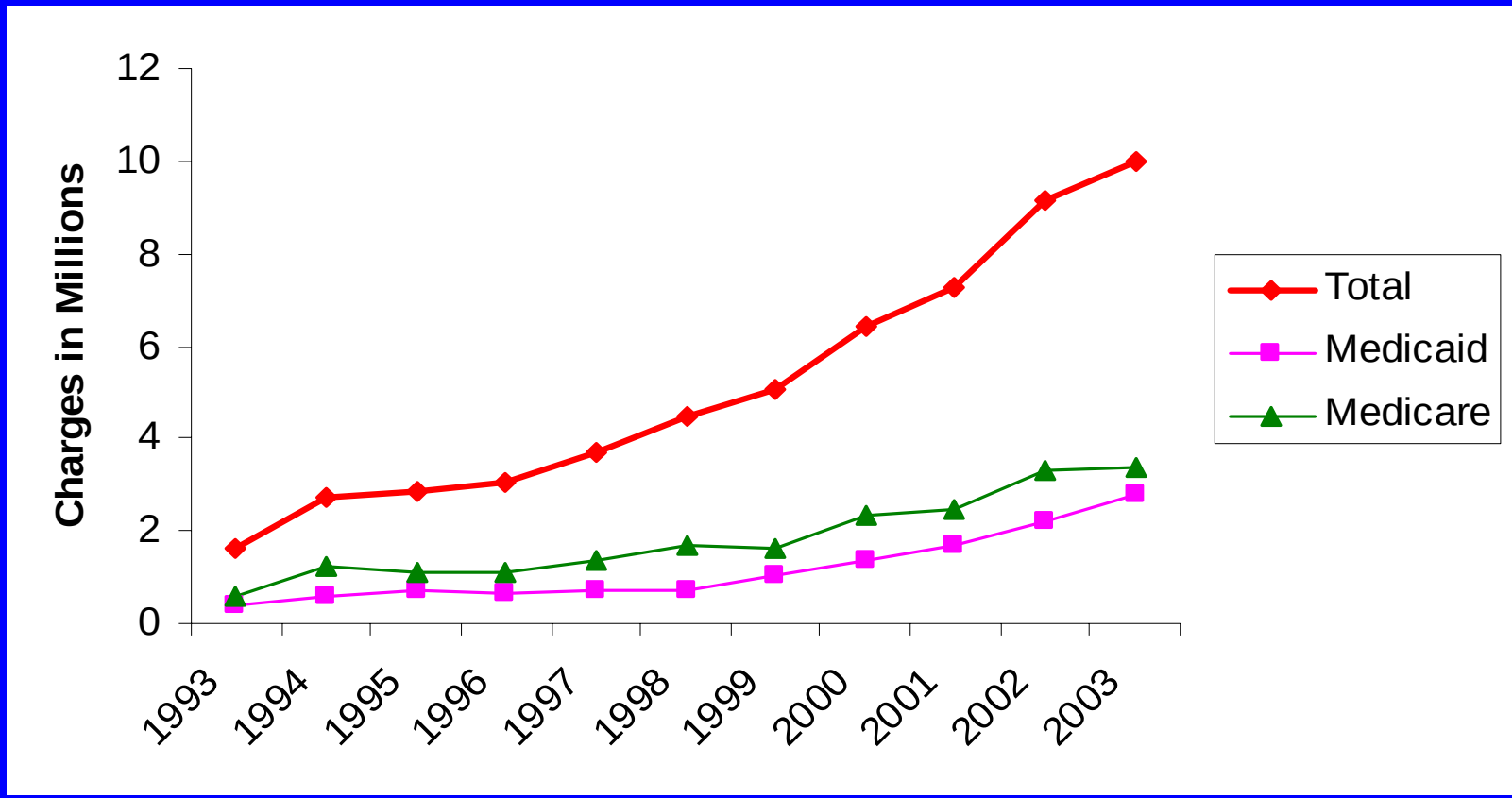
Diabetes Emergency Room Charges* in Missouri, 1993-2003

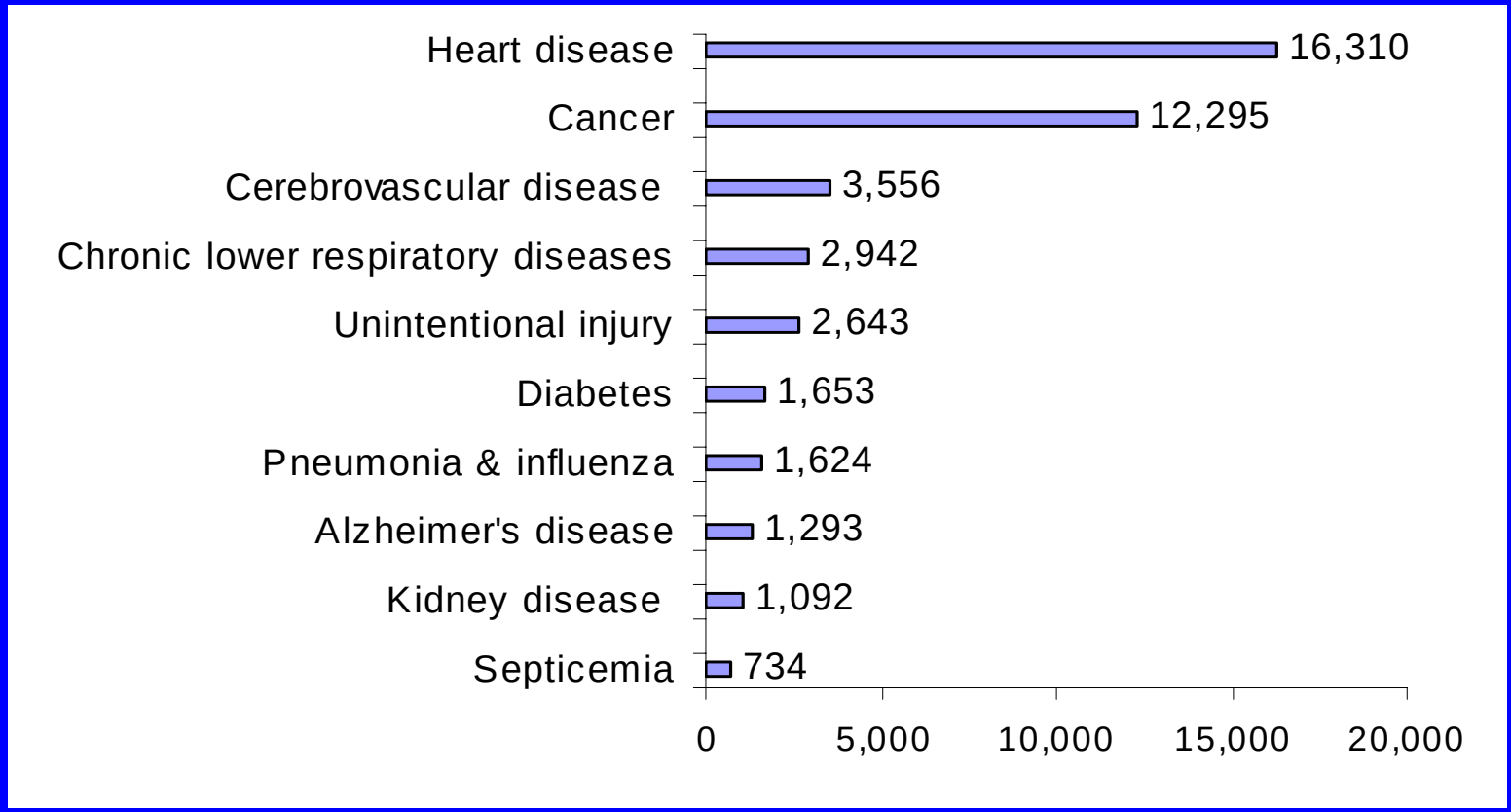


* Diabetes as the principal diagnosis

Diabetes Is Disabling

- Diabetes is the leading cause of
  - End-stage renal disease (ESRD)
  - Adult blindness
  - Non-traumatic lower-extremity amputation
  - Impotence
- Diabetes increases the risk of
  - Heart disease
  - Stroke
  - Complications from influenza and pneumonia
  - Hypertension

The Leading Causes of Death in Missouri, 2003



Diabetes: A Challenge for Public Health

What is the lifetime risk for diabetes for people born in the United States in 2000?

1 of 3 Americans

1 of 2 Hispanic females

2 of 5 African Americans and Hispanics

Control diabetes. For life.

CDC

Risk Factors for Type 1 Diabetes

- Largely unknown
- Race: whites > non-whites
- Exposure to cow's milk during infancy?
- Virus infection?
  - Coxsackie B4 virus
  - Human cytomegalovirus (CMV)
  - Rubivirus

Risk Factors for Type 2 Diabetes

- Age
- Race/ethnicity
- Family history
- Previous GDM or gave birth to a baby weighing > 9 lbs

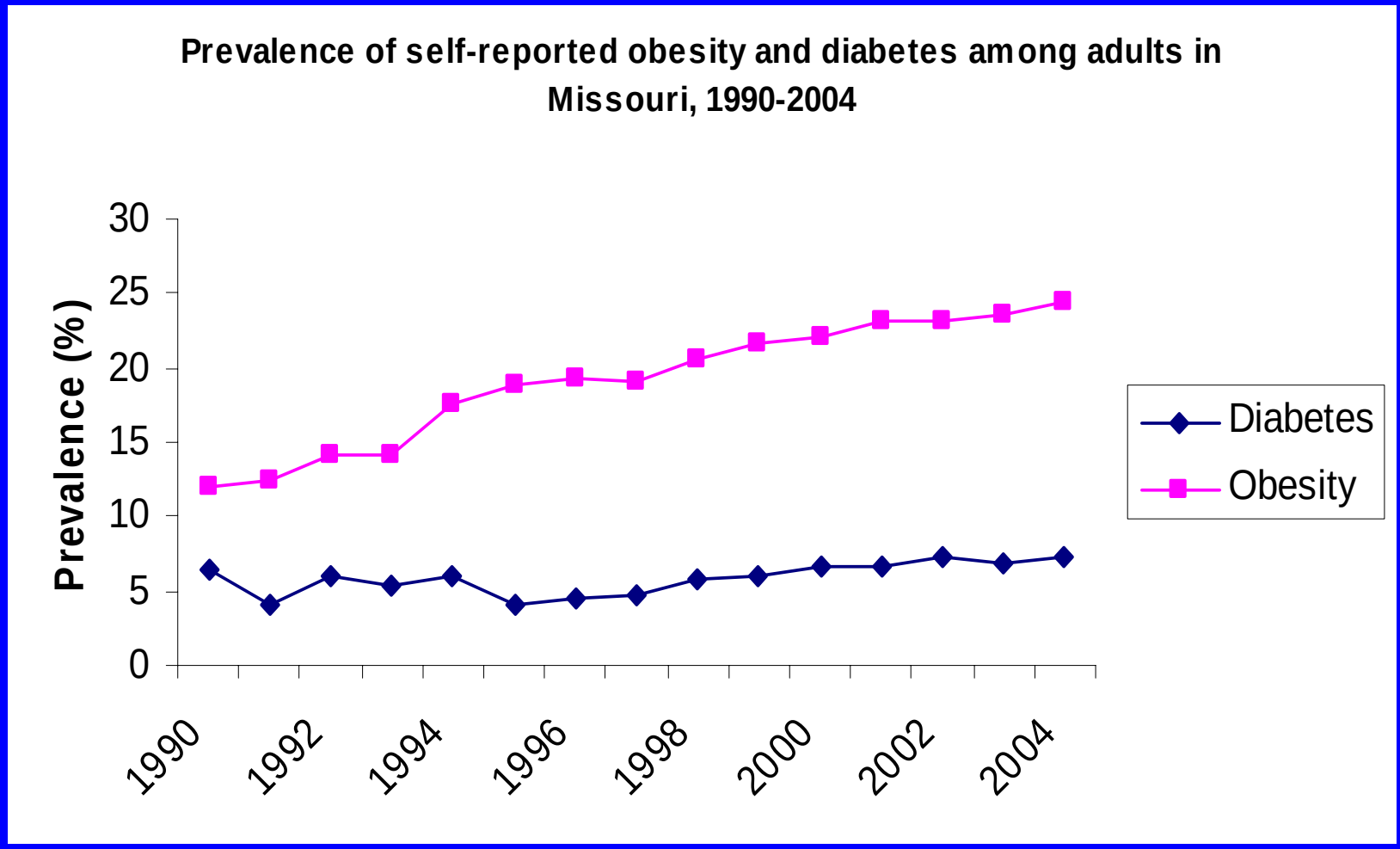
Risk Factors for Type 2 Diabetes

- Overweight and obesity
- Inactive lifestyle
- Hypertension
- Abnormal lipid levels

Risk Factors for Type 2 Diabetes

- Cigarette smoking
- IGI or IFG on previous testing
- History of vascular disease
- Polycystic ovary syndrome

Twin Epidemics



Intervention Strategies for Diabetes

- Primary Prevention
  - identifies and protects susceptible individuals from developing diabetes.
  - Diabetes Prevention Program
    - Type 2 diabetes is preventable
    - Prevention is cost-effective

Intervention Strategies for Diabetes

- Secondary Prevention
  - Early detection of pre-diabetes and diabetes through screening
    - Is not recommended by ADA for type 1 diabetes
    - Is recommended by ADA for type 2 diabetes if certain criteria are met
    - Is recommended for all pregnancies except for women with low-risk status

Intervention Strategies for Diabetes

- Tertiary Prevention
  - Preventing or delaying the complications of Diabetes
    - Ongoing patient-centered care
    - Glycemic control
    - Medical nutrition therapy
    - Physical activity
    - Psychosocial assessment and care

Intervention Strategies for Diabetes

- Tertiary prevention
  - Hypertension control
  - Dislipidemia management
  - Anti-platelet agents use
  - Smoking cessation
  - CHD screening and treatment
  - Nephropathy screening and treatment
  - Retinopathy screening and treatment

Intervention Strategies for Diabetes

- Tertiary prevention
  - Foot care
  - Dental Care
  - Vaccinations
  - Diabetes self-management education