

# Diabetes Best Practices

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# Discussion

- Diabetes Data
  - The bad news—and the good!
- Tools available on the IHS DDTP website:
  - Best Practices
  - Standards of Care
  - Diabetes Treatment Algorithms
- CKD: screening

# Burden of Diabetes in the U.S.

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- **Disproportionately affects ethnic, minority and lower socioeconomic groups:**

**NHWhites: 8.4%**

**NHBlacks: 11.4%**

**Hispanic/Lat: 8.2%**

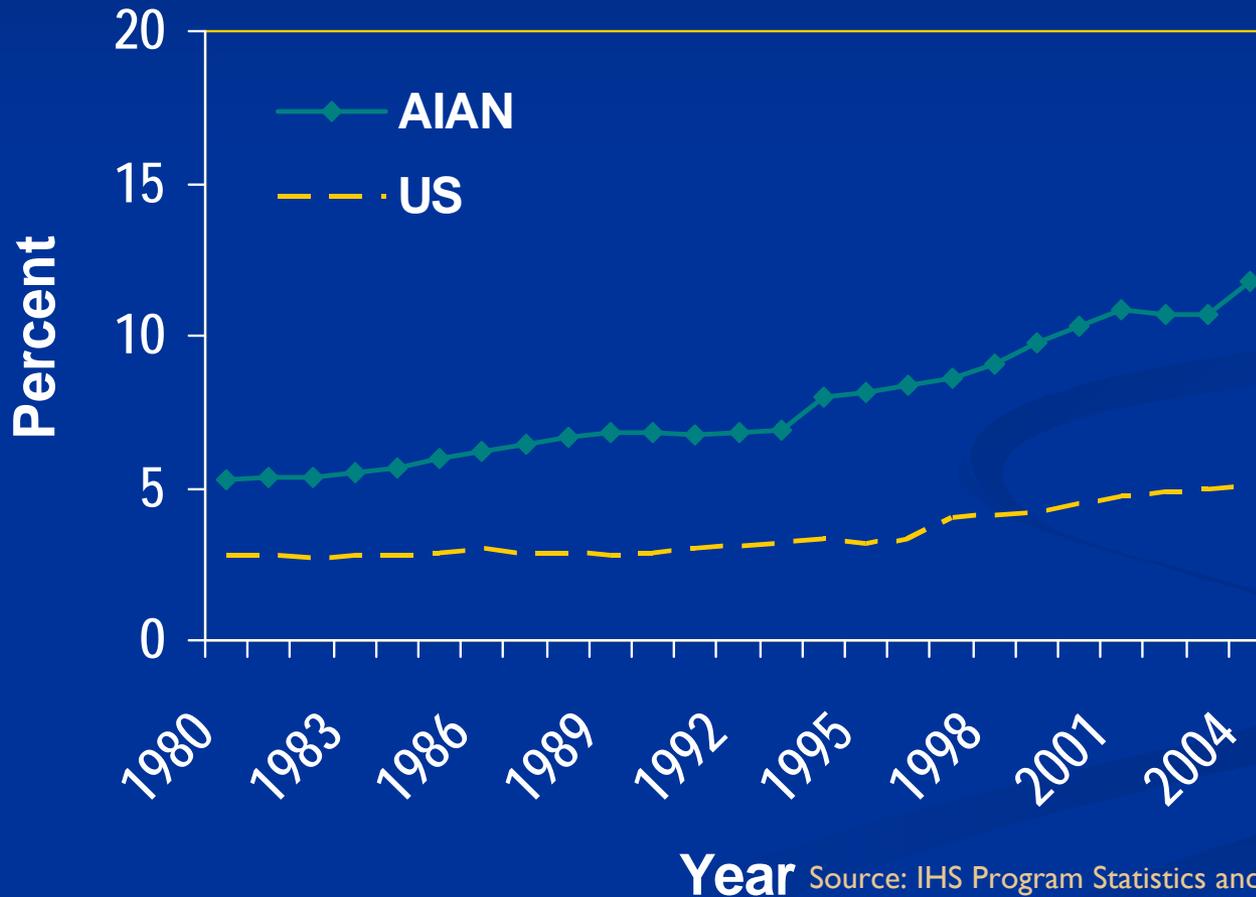
**AI/AN: 14.5%**

- **Increases the risk of heart attack and stroke by 2-4 times**
- **The leading cause of new blindness, end stage renal disease, and amputation**

# Prevalence of Diagnosed Diabetes

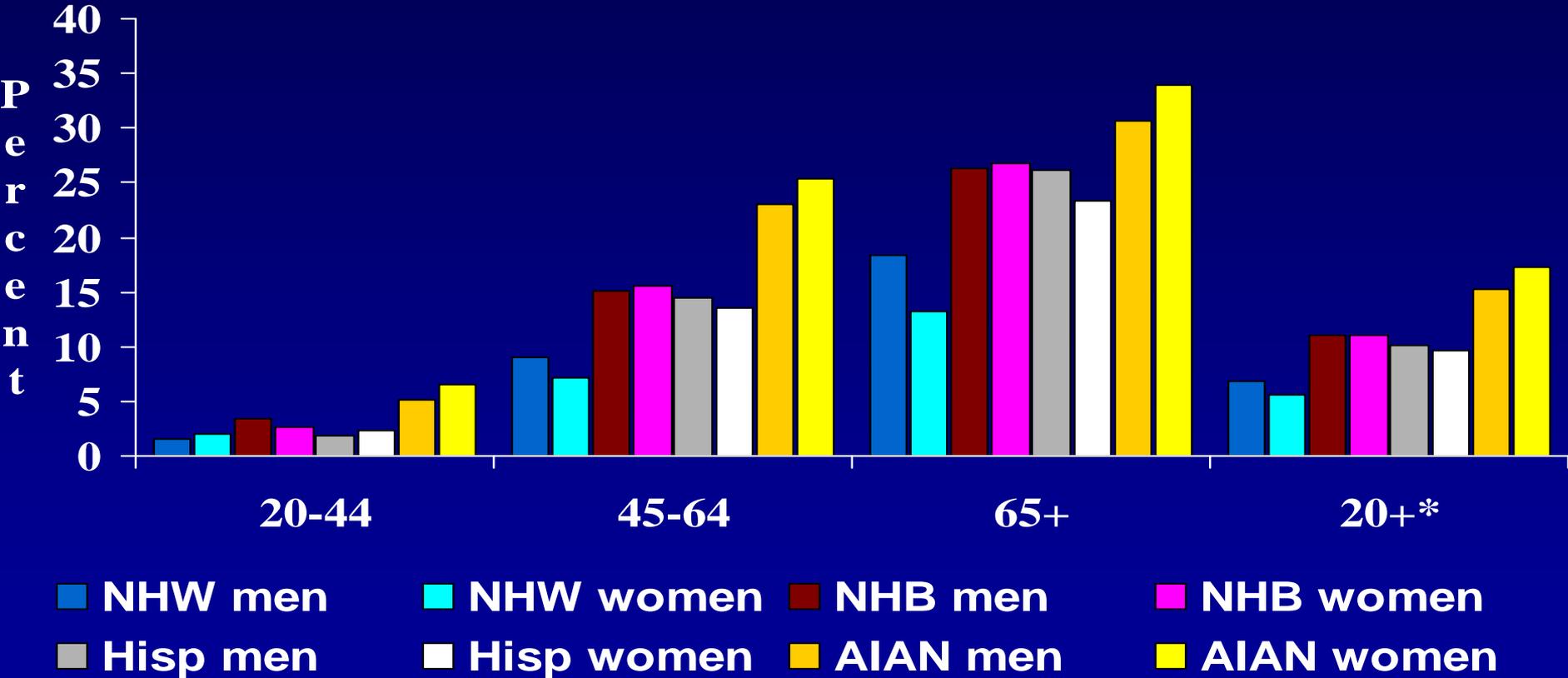
## AI/ANs compared to U.S. population

1980- 2004



Year Source: IHS Program Statistics and National Diabetes Surveillance System. Age-adjusted to the 2000 US standard population with the exception of 1981–1993 data for AIAN, which was age-adjusted to the 1980 US standard population.

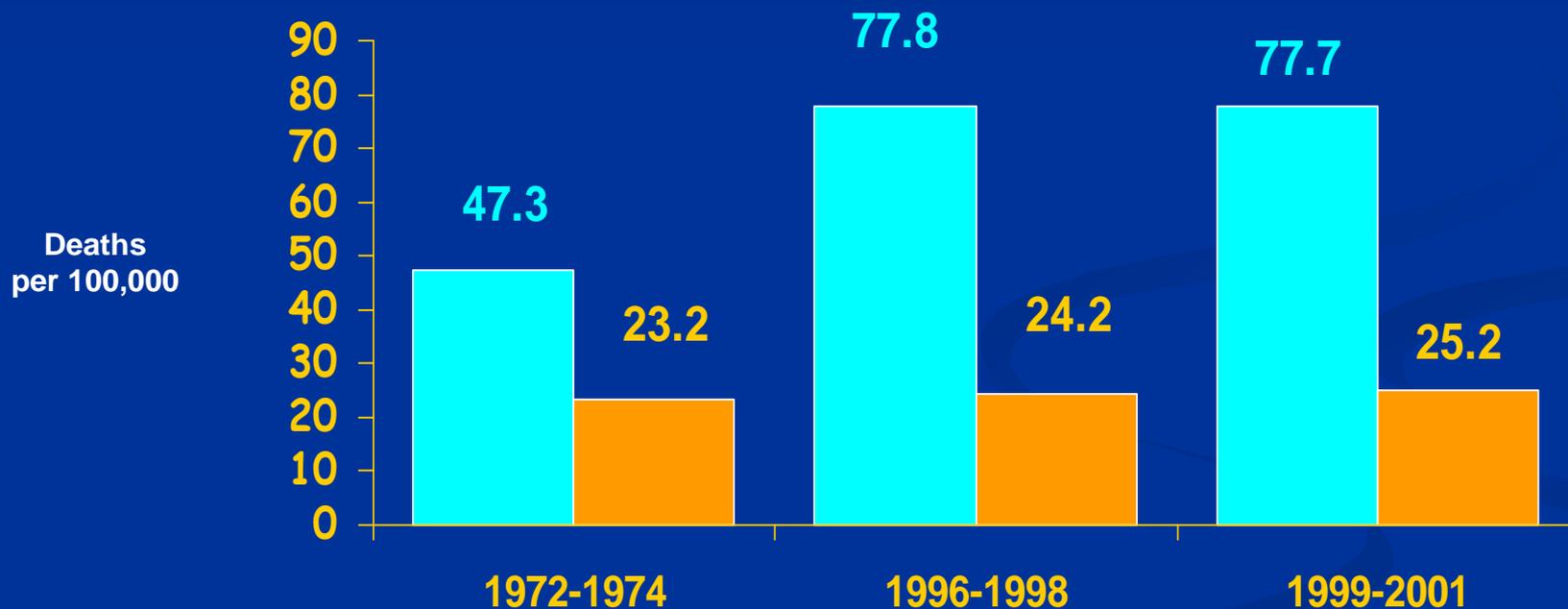
# Prevalence of diagnosed diabetes among adults, by age, race/ethnicity, and sex, United States, 2004



\*Age-adjusted based on the 2000 U.S. population  
 Source: 2003-04 National Health Interview Survey (NHIS) and 2004 Indian Health Service outpatient database.

# Diabetes Mortality Rate\* American Indians and Alaska Natives in the IHS Service Area, 1972-1974, 1996-1998, 1999-2001, and U.S. All Races 1973, 1997, 2000

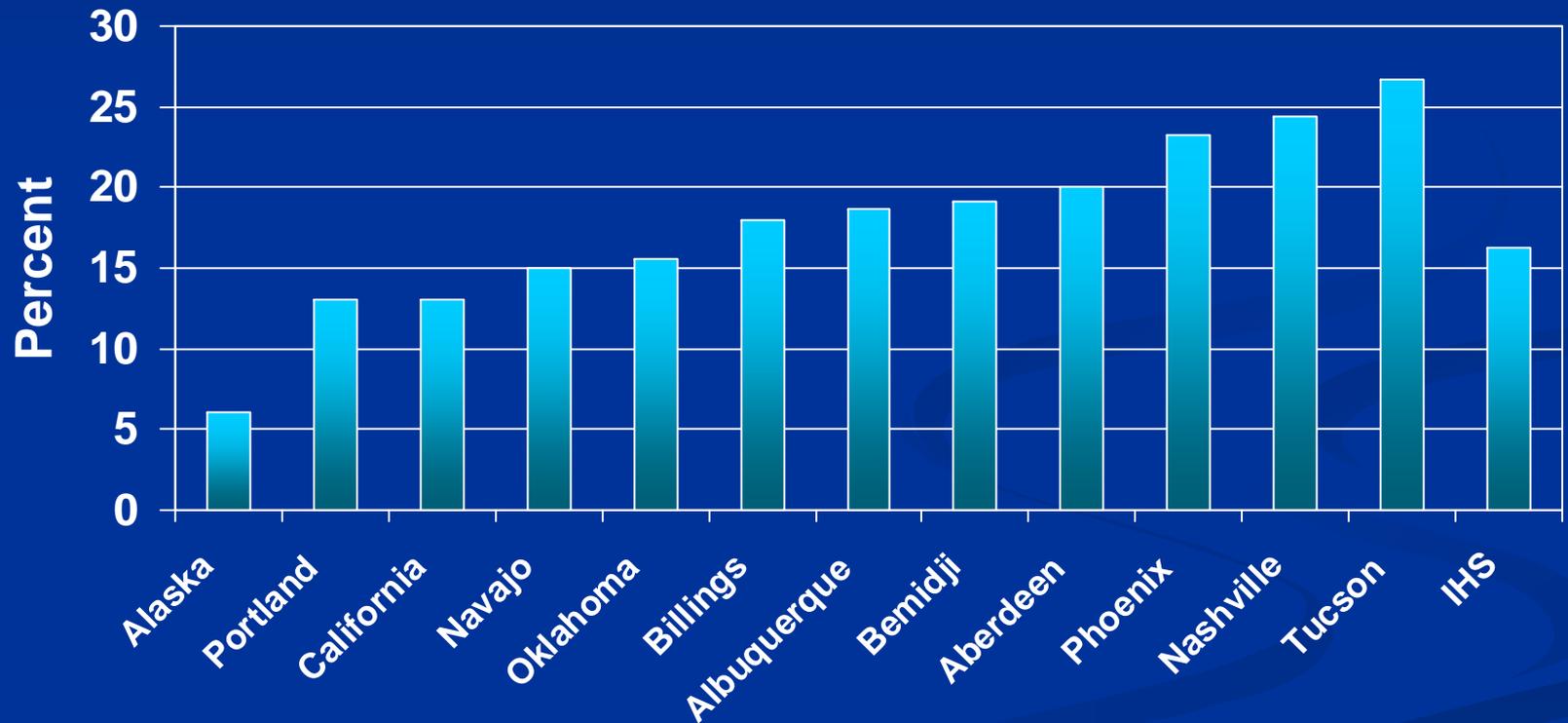
■ IHS-Wide ■ US All Races



\*Age-adjusted based on the 2000 U.S. population

Source: IHS Division of Program Statistics and National Center for Health Statistics

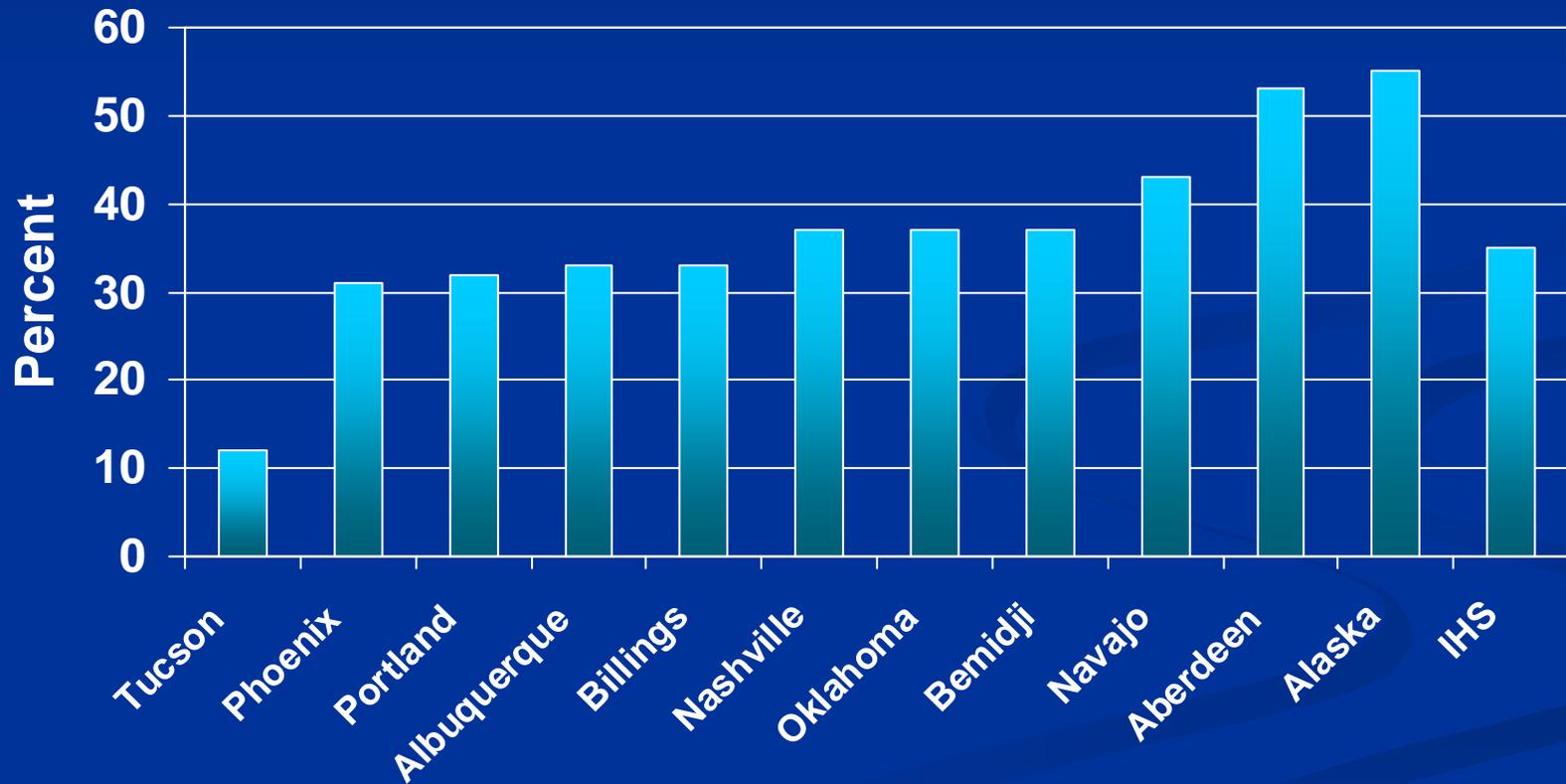
# Age-adjusted\* prevalence of diagnosed diabetes among American Indians/Alaska Natives, by area, Indian Health Service 2004



\*Age-adjusted based on the 2000 U.S. population

Source: FY04 IHS APC files. Excludes data from 30 service units (4% of the IHS user population).

# Increase in age-adjusted\* prevalence of diagnosed diabetes among American Indians/Alaska Natives aged 20 years or older, by IHS area†, 1997 and 2004

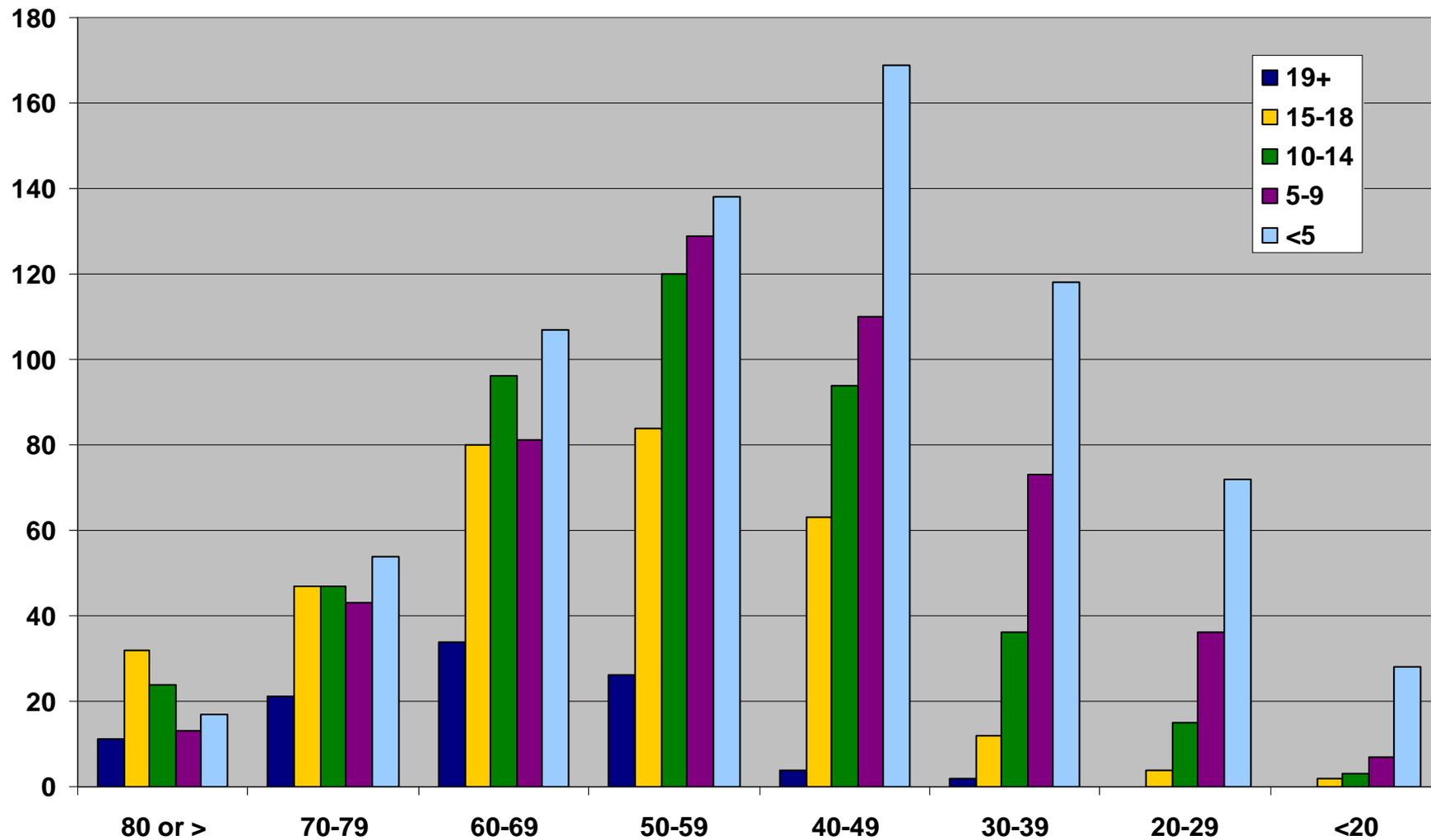


\*Age-adjusted based on the 2000 U.S. population

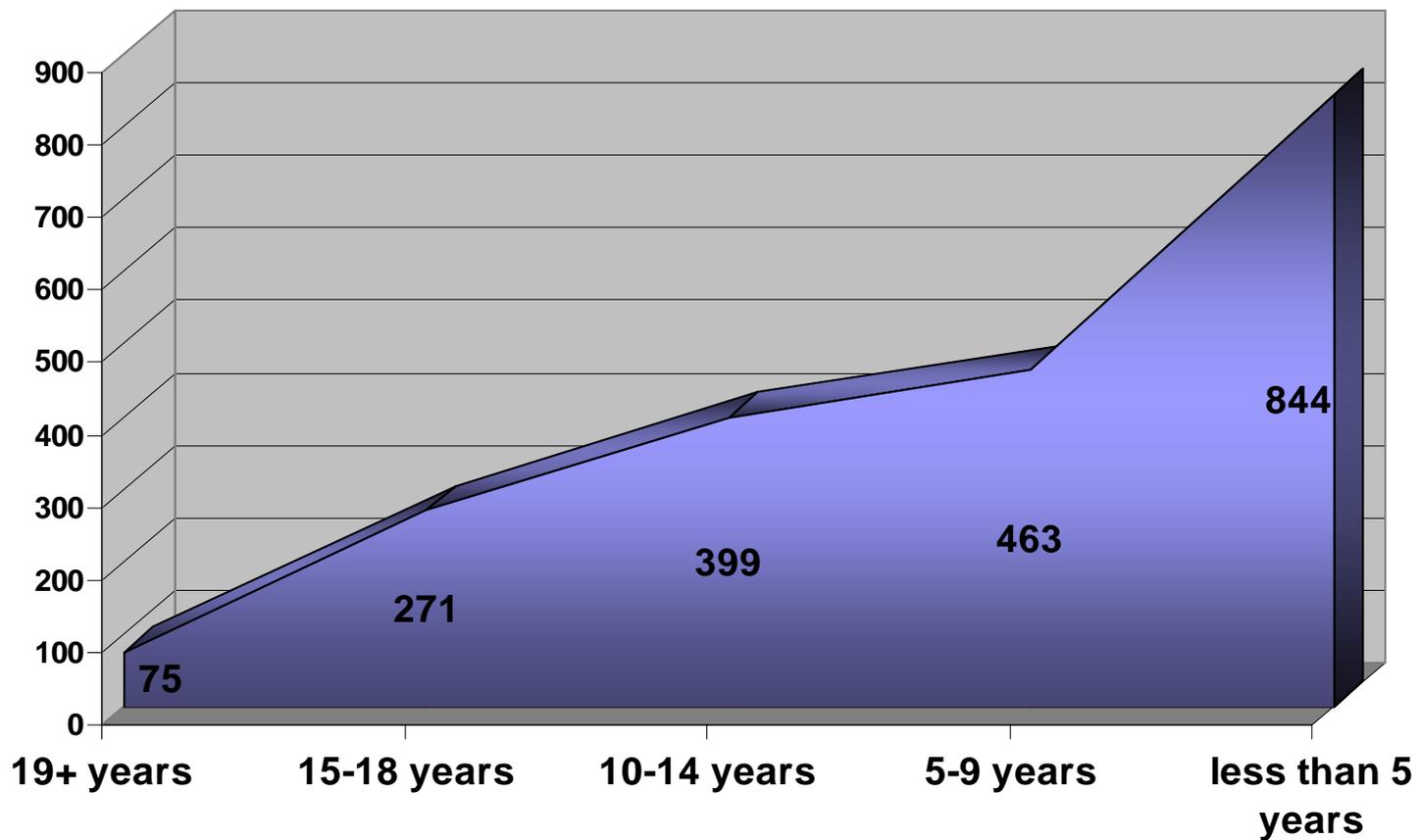
†Age-adjusted diabetes prevalence in California was the same in 1997 and in 2004 (13%).

Source: FY97–04 IHS APC files. Excludes data from 30 service units (4% of the IHS user population).

## Number of Diabetic Patients Per Current Age / Number of Years Since Diagnosis (Total Number of Patients = 2052)

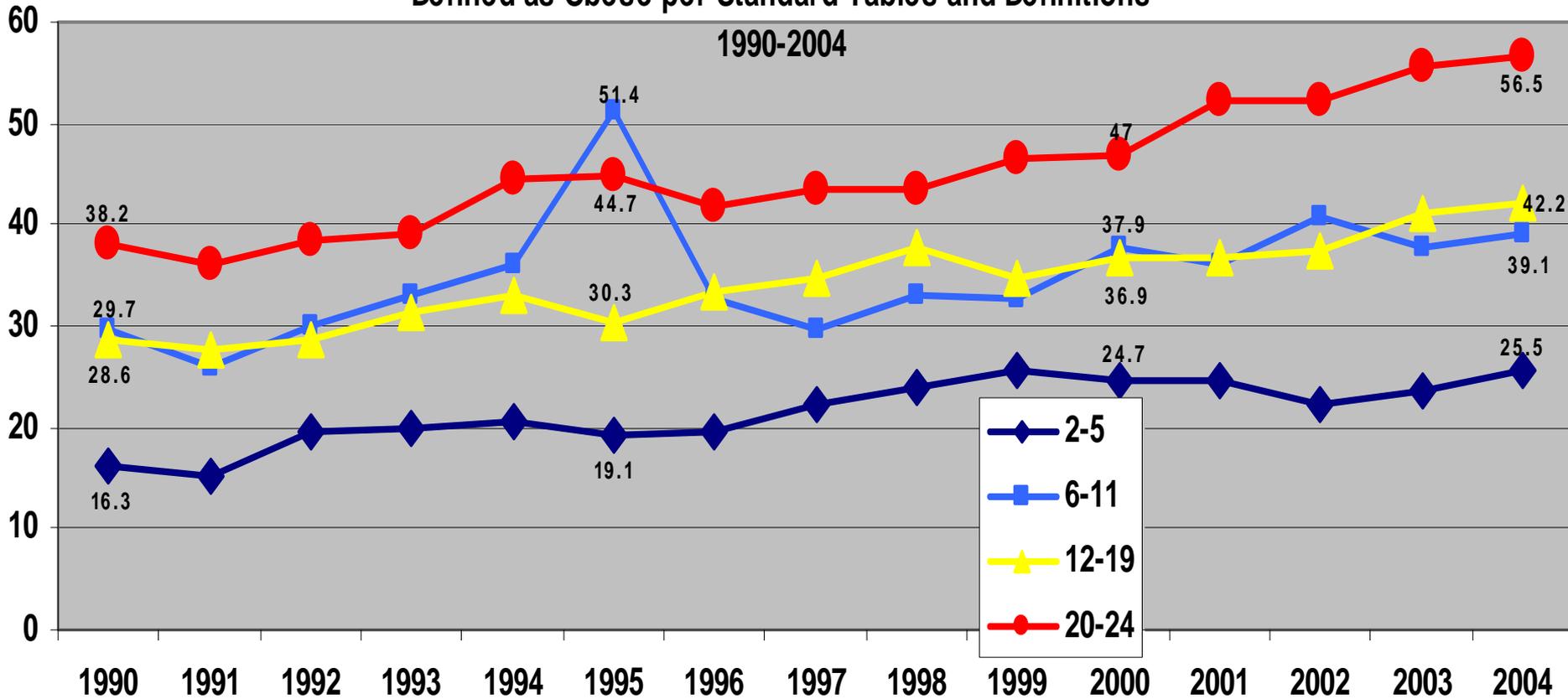


### Numbers of Living Patients with Diabetes (n=2052): Number of Years Since Initial Diabetes Diagnosis



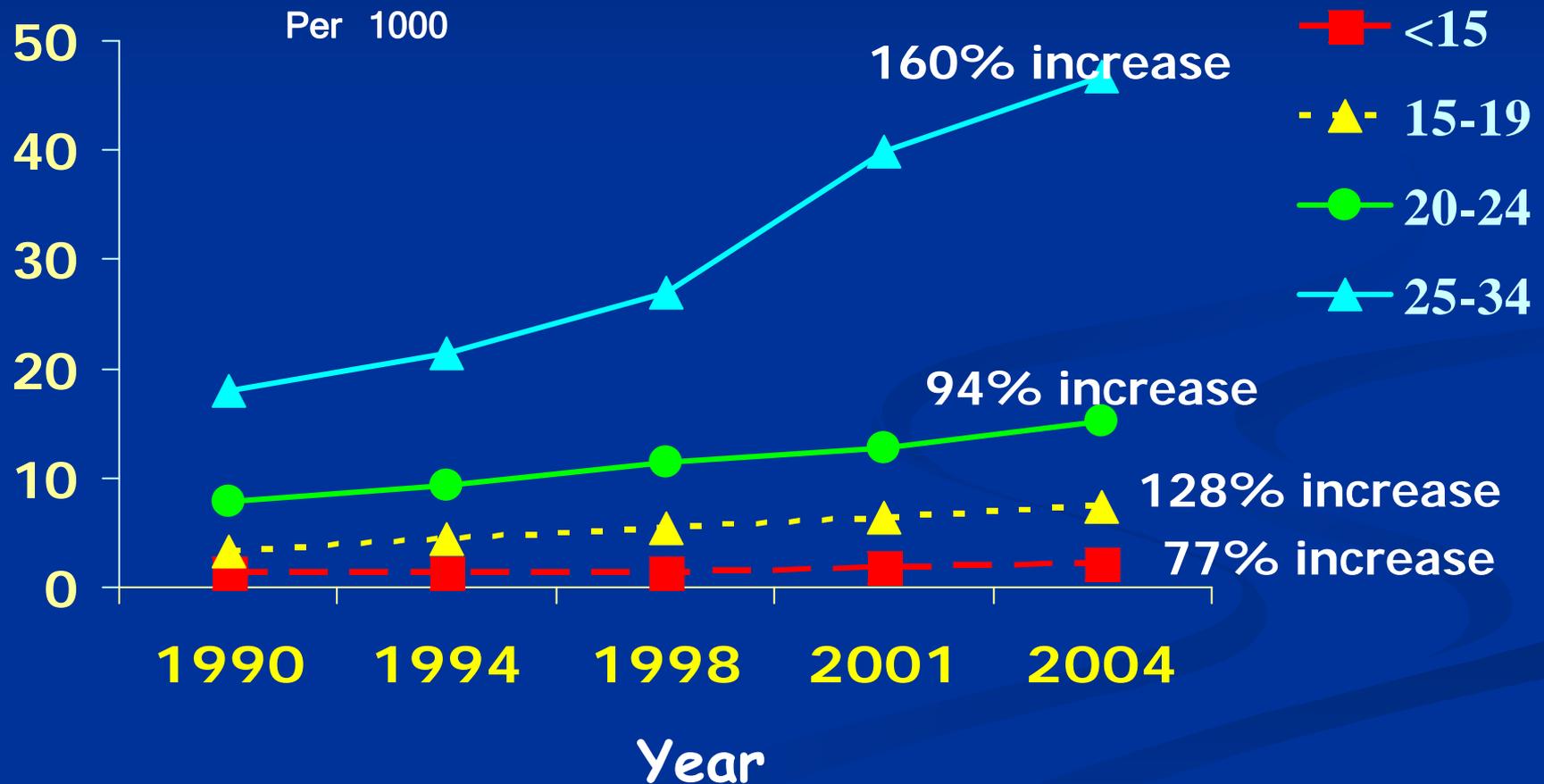
# Obesity In Cherokee Youth

Percentages of Active Clinical Users Per Age Group  
Defined as Obese per Standard Tables and Definitions



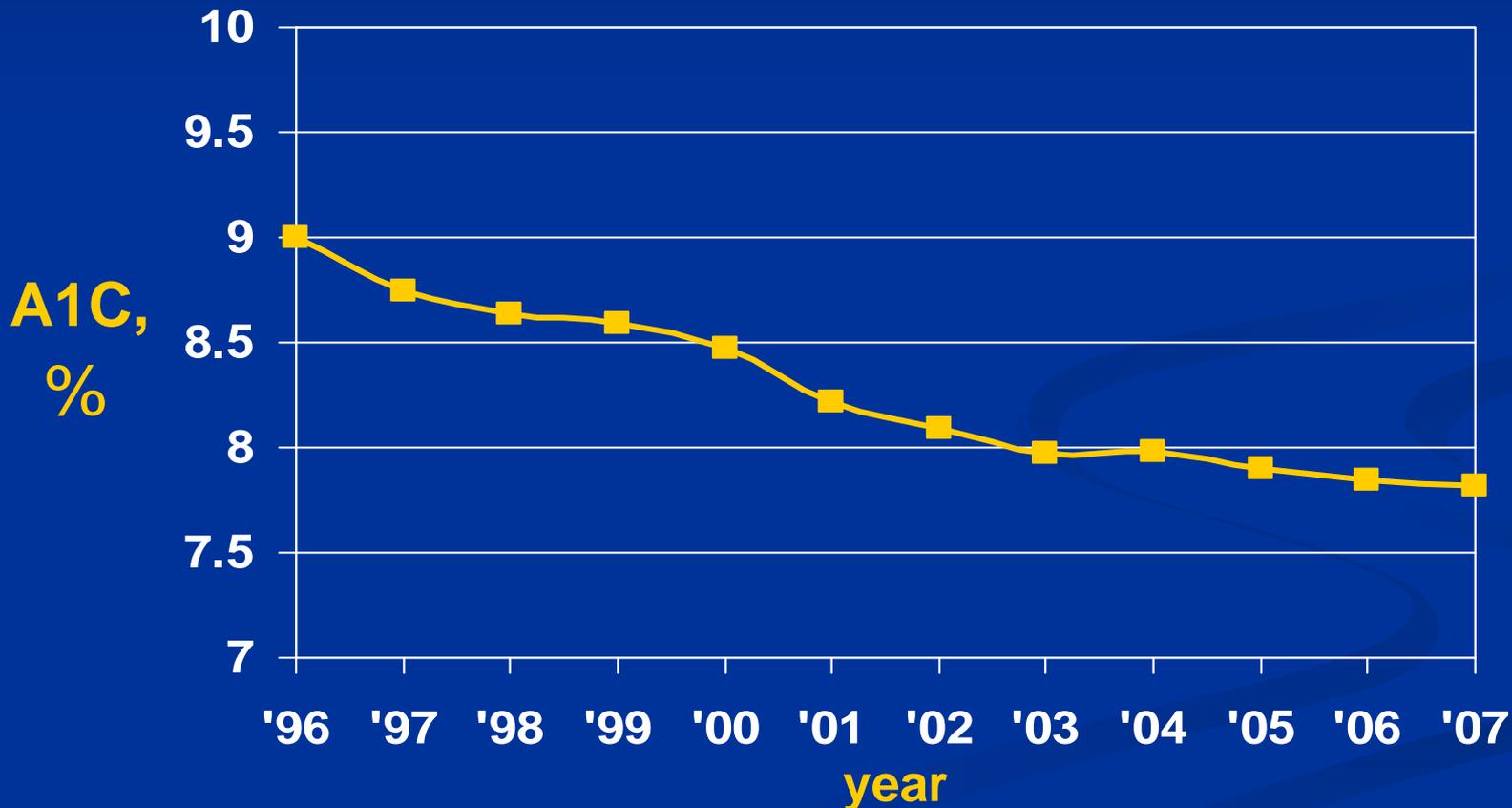
Predicting Future Trends in Diabetes

# Prevalence of diagnosed diabetes among children and young people, by age group, 1990-2004



# IHS Diabetes Care & Outcomes Audit

Mean A1C,  
1996-2007



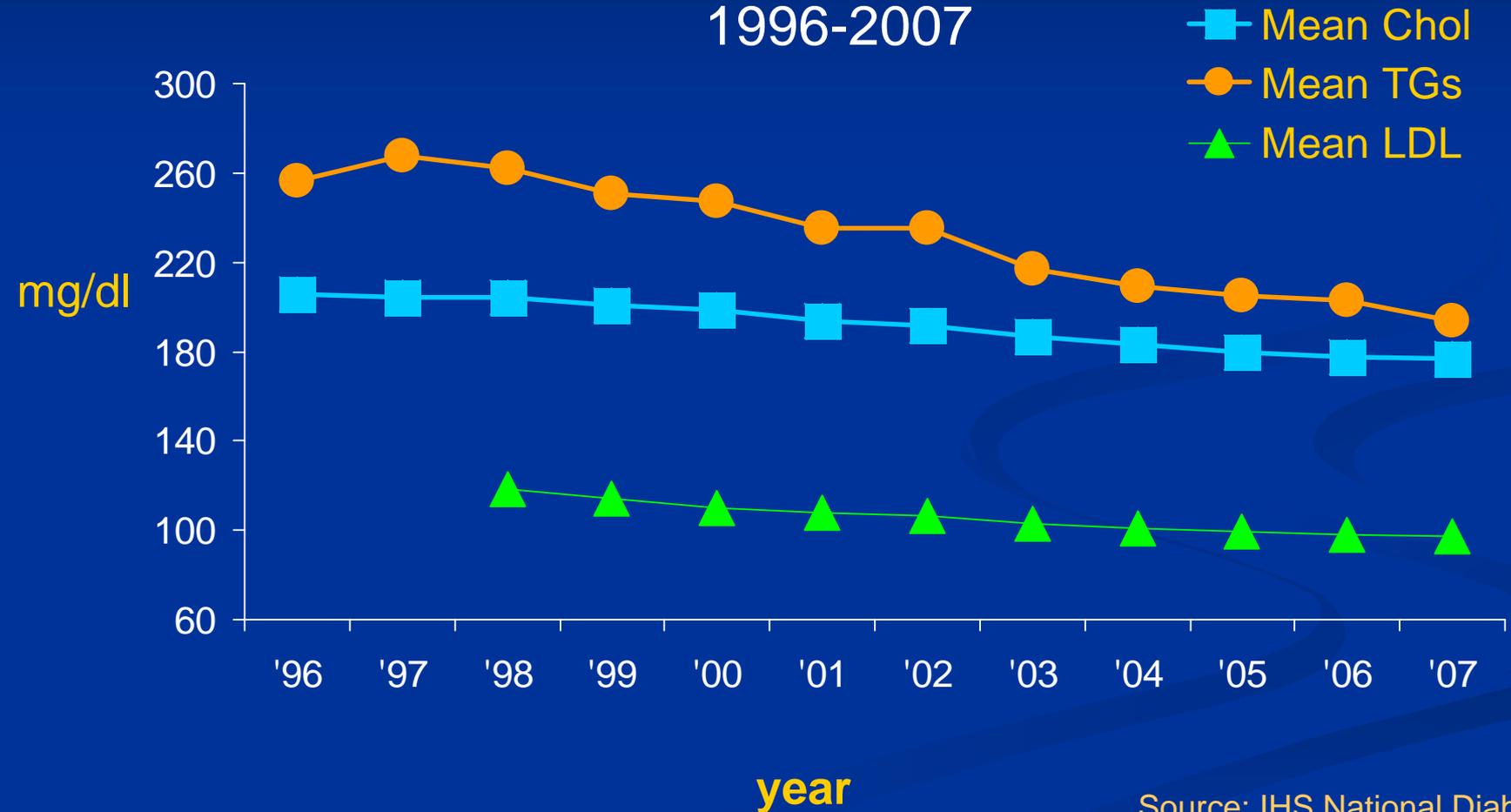
\* $p < 0.0001$  comparing mean A1C levels in FY96 and FY07

Source: IHS National Diabetes  
Program Statistics 1996-2007

# IHS Diabetes Care & Outcomes Audit

## Mean Lipid Values

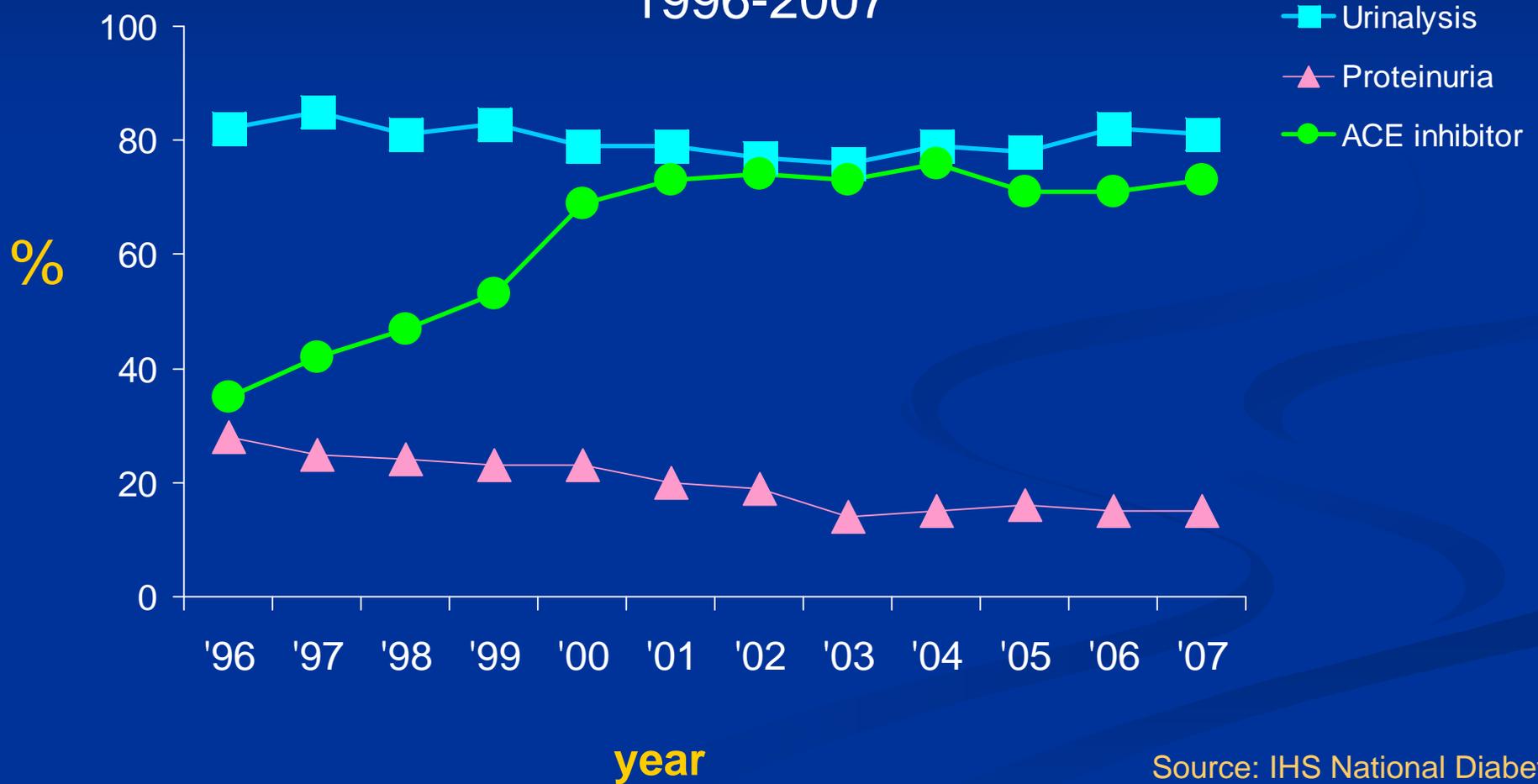
1996-2007



Source: IHS National Diabetes Program Statistics 1996-2007

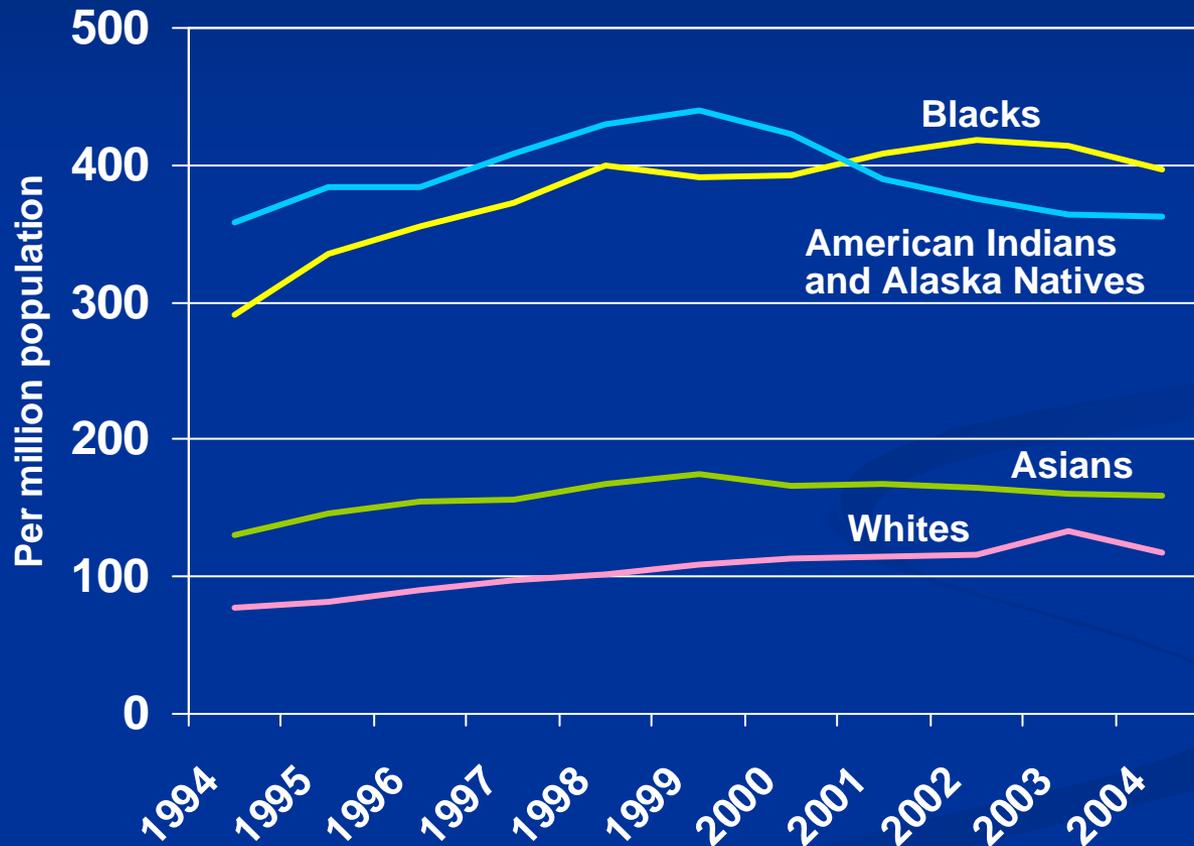
# IHS Diabetes Care & Outcomes Audit

## Kidney Disease 1996-2007



Source: IHS National Diabetes Program Statistics 1996-2007

# Age-adjusted\* rate of persons initiating therapy for end-stage renal disease with diabetes as the primary diagnosis, by race, United States, 1994–2004



\*Based on the 2000 US population

Source: CDC. Racial Differences in Trends of End-Stage Renal Disease, by Primary Diagnosis --- US, 1994--2004. MMWR March 23, 2007 / 56(11);253-256

# Best Practices

- A *Best Practice* is a process, technique, or approach that is universally recognized as a standard of excellence within a defined group or population.
- The IHS Diabetes Best Practices
  - 19 documents which incorporate:
    - Medical literature, recognized national guidelines
    - Lessons learned within the Indian Health System
    - Written with I/T/U programs of varying types and sizes in mind
    - Goal of each BP: significantly improve performance, from whatever level the program is starting from

# IHS Diabetes Best Practices

- Updated again in 2009
- 19 topics in diabetes treatment and prevention
  - Written by subject matter experts in the Indian Health System
- Each Indian Health Diabetes Best Practice provides:
  - Guidelines for the best practice.
  - Key recommendations
  - How to monitor progress and outcomes, including key measures
  - Specific clinical, community and organization recommendations
  - How to evaluate and sustain your program
  - Tools and resources, including examples of current best practice programs, and additional contacts and references
  - Specific suggestions on improving the best practice program in the Indian Health System

# Best Practices: Clinical

- Adult Weight Management
- CVD and Diabetes
- CKD and DM
- Depression Care and DM
- Eye Care
- Foot Care
- Oral Health
- Pharmaceutical Care
- Youth and Type 2 DM

# Best Practices: Community

- Breastfeeding
- Community Advocacy and DM
- Community DM Screening
- DM Case Management
- DM and Pregnancy
- DM Self-Management Education
- DM Systems of Care
- Nutrition
- Physical Activity
- School Health and DM

# IHS Standards of Care for Adults with Type 2 Diabetes

- Full of information on all aspects of DM care
- Standards diabetes programs should strive to meet
- Written by Indian Health System experts with emphasis on issues for AI/AN patients
  - Based on national standards
  - Updated 2009

# SOC Topics

- Summary of 2009 Revisions
- Clinic Visit Checklists
- 1.Components of the initial comprehensive evaluation.
- 2.Ongoing management recommendations.
- Criteria for the diagnosis of type 2 diabetes in adults
- Glycemic control and microvascular risk reduction
- Assessment of glycemic control
- Assessment of chronic kidney disease
- Diabetes eye examination
- Diabetes foot care
- Diabetes dental care
- 3.Cardiovascular disease risk reduction
- Assessment and management of blood pressure
- Assessment and management of dyslipidemia
- Antiplatelet therapy
- Anthropometric measurements
- Medical Nutrition Therapy and nutrition education
- Diabetes self-management education
- Physical activity and exercise
- Mental and emotional health: Screening for depression in patients with diabetes....23
- Tobacco
- Alcohol and other substance use
- Distinguishing type 1 and type 2 diabetes
- Pregnancy and diabetes
- Cancer screening
- Tuberculosis screening and treatment
- Diabetes neuropathies
- Peripheral arterial disease in diabetes
- Anemia
- Nonalcoholic fatty liver disease and nonalcoholic steatohepatitis
- Bariatric Surgery
- Estimated Average Glucose (eAG)

# Algorithm Cards

- First created in Cherokee in 1997
- Simple to use by providers who don't "do" diabetes
  - Found other algorithms cumbersome
  - Goal: "every visit is a diabetes visit"
- Easy and inexpensive to produce
  - written on computer, printed locally
- Updateable (this is 4<sup>th</sup> update)
  - changes in standards of care
  - formulary changes

# Algorithms

- Adapt to local formulary medications
  - minimizes frustration
- Dosing information
  - providers don't need to look up dose
- ADA, IHS, JNC VII, ATP III, KDOQI, and other international standards of care
- Fit in white coat pocket
- Collaborative: written by MD-PharmD team with input from rest of clinical staff
- Cards on Glucose Control, HTN, Lipids, Insulin and CKD—and now urine albumin testing

# National Diabetes Treatment Algorithms

- IHS Core Formulary meds
- Both meds and algorithms are customizable and updatable in electronic format
  - to local formulary
  - to local preference for treatment paths

# National Review



## Type 2 DM – Glucose Control

### DM DX – at least two (same or combination)

1. FPG  $\geq$  126
2. 2° (OGTT)  $\geq$  200
3. Non-fasting lab glucose  $\geq$  200 with symptoms

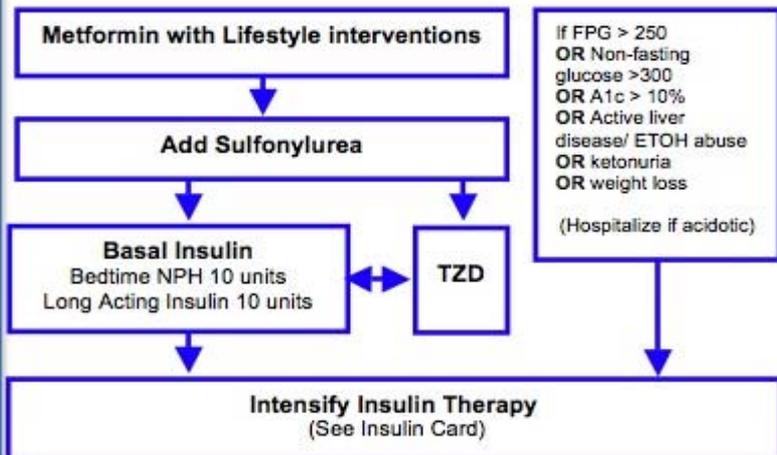
Impaired Fasting Glucose = FPG 100-125

Impaired Glucose Tolerance = 2° OGTT 140-199

### DM BG Targets

Premeal: < 70-130  
 2°PP: <160-180  
 A<sub>1</sub>C: 6.5-7%

Individualize if elderly  
 or co-morbidity



### Immunizations

**Pneumovax**—At Dx & again at age 65  
 (if  $\geq$ 5 yrs. since 1<sup>st</sup> shot)  
**Flu shots** yearly  
**Td/Tdap** (routine)  
**PPD** once after Dx of DM (Pos is  $\geq$ 10mm)

### Don't Forget

**Glucose toxicity**— Insulin production ↓'s if prolonged hyperglycemia; insulin shots short-term reverse this.  
**Pancreatic Exhaustion**— Almost all Type 2 diabetics will eventually require insulin.

### Monitoring of DM

A<sub>1</sub>c every 3 months  
 Creatinine and GFR yearly  
 UA yearly  
 Microalbumin yearly  
 Lipid Panel yearly  
 EKG every 2-5 years  
 Complete Foot Exam yearly  
 - Foot inspection each visit  
 Retinopathy exam yearly  
 Paps, Mammograms,  
 Contraception  
 Evaluate sexual function  
 Depression, Tobacco, ETOH,  
 DV screening yearly

## Type 2 DM – Glucose Control

### Biguanides: Metformin & Metformin XR (Glucophage®)

Start 500 mg daily with meals and increase no faster than 500 mg each week. If GI sx occur may increase more slowly.

Max. dose: 2000mg daily or divided with XR tablets. Do not split XR tablets.  
 2500 mg divided BID-TID with regular release tablets.

Can decrease weight. Pt. must have normal creatinine (males <1.5, females <1.4), no heart failure or liver disease (check ALT) and no significant ETOH use. Discontinue before surgery or IV contrast dye administration.

### Sulfonylureas: Glyburide (Micronase®) and Glipizide (Glucotrol®)

Start 2.5-5mg daily – Max 10 mg BID

Can increase weight and cause hypoglycemia

### Thiazolidinediones: Pioglitazone (Actos®)

Start 15mg daily; may increase to 30mg daily (little benefit dosing over 30mg)

Max A<sub>1</sub>c changes may take up to 12 weeks to occur

Check ALT at baseline & periodically. No underlying liver dz or significant ETOH use.  
 Warning: may cause Heart Failure. May use in renal insufficiency. Can cause weight gain.

### Sitagliptin (Januvia®) - DPP-4 Inhibitor

May reduce weight, mild to mod A<sub>1</sub>c lowering

Dose: 100mg PO daily

Reduce dose if  $\geq$  Stage 3 CKD

### Vildagliptin (Galvus®) - DPP-4 Inhibitor

May reduce weight

Dose: 50-100mg PO daily

### Exenatide (Byetta®) - GLP1 mimetic

May reduce weight, mild to mod A<sub>1</sub>c lowering

Start 5 mcg/dose BID

Administer 60 minutes before meals

*Weekly dose (Byetta LA®) is under investigation*

May increase to 10 mcg/dose BID after 1 month of treatment

Do not use if  $\geq$  Stage 4 CKD Do not mix in same syringe as insulin

May be associated with pancreatitis – seek medical care if persistent severe abdominal pain with or without vomiting

### Pramlintide (Symlin®) - Amylin mimetic

Use in Type 2 Diabetes unclear; May consider in Type 1 Diabetes

Start 60micrograms daily subcutaneously immediately before a major meal

(Reduce preprandial (short acting) insulin by 50% as appropriate)

May increase to 120micrograms after significant nausea is gone x 3-7 days

Do not mix in same syringe as insulin

Drugs names in *italics* are not on the IHS National Core Formulary

Ref: ADA Clinical Practice Recommendations 2007, 2008  
[http://care.diabetesjournals.org/content/vol30/suppl\\_1/](http://care.diabetesjournals.org/content/vol30/suppl_1/)

## Type 2 DM – Hypertension

### First Line

Therapeutic Lifestyle Changes

ACE Inhibitor: Lisinopril / Captopril  
ARB (if cough/angioedema on ACEI)

### Second

Diuretic  
HCTZ

### Third/Fourth

β-Blocker  
Metoprolol / Atenolol

Calcium Channel Blocker  
Diltiazem

### May Consider adding

Clonidine

Alpha Blocker  
Doxazosin/Terazosin

**BP TARGET**  
**<130/80**

Treat to Achieve  
This Goal

Ref: JNC VII;  
[www.nhlbi.nih.gov/guidelines/hypertension/index.htm](http://www.nhlbi.nih.gov/guidelines/hypertension/index.htm)

## Type 2 DM – Hypertension

### ACE Inhibitors (ACEI)/ARBs

Renal protective in diabetics—consider using if Micral (+), even if BP < 130/80. Can cause ↑ K<sup>+</sup>, ↑ creatinine; cough (not with ARB), rarely angioedema.

Lisinopril (Prinivil/Zestril®)	Start 2.5-5mg daily; usually 20-40mg daily
Captopril (Coaten®)	Start 12.5 BID-TID; max 150mg TID
Losartan (Cozaar®)	Start 25-50mg daily; usually 100mg daily Consider if unable to tolerate ACEI
Telmisartan (Micardis®)	Start 40mg daily; usually 20-80mg daily Consider if unable to tolerate ACEI

### Diuretics

HCTZ	Start 12.5-25 mg daily; usually 25mg daily Can ↓ K <sup>+</sup> . (Problems ↑ with higher doses > 25mg)
Maxzide®	Dose: ½ tab daily (to keep HCTZ dose at 25mg); 1 tab = 50mg HCTZ/75mg triamterene; K <sup>+</sup> sparing – Caution esp. in CKD

### β-blockers (BABA)

Don't use if bradycardia or 2<sup>nd</sup>/3<sup>rd</sup> degree block.

Caution in Severe: CHF, Asthma, or Renal dysfunction

Atenolol (Tenormin®)	Start 25-50mg daily-BID; usually 50-100mg daily Eliminated renally (caution Renal Failure)
Metoprolol (Lopressor®)	Start 50-100mg BID; usually 100-450mg daily in 1-2 divided doses. (XR formulation dosed once daily) Eliminated hepatically (caution in Liver Failure) Preferred β-Blocker for renal dysfunction or heart failure
Carvedilol (Coreg®)	Start 3, 12.5-6.25mg; Usual dose 25mg BID Consider in patients with heart failure

### Calcium Channel Blockers (CCBA)

Diltiazem CD (Cardizem®)	Start 120mg daily; usually 120-420mg daily
Amlodipine (Norvasc®)	Start 5mg daily; 5-10mg daily consider in patients with angina or CHF
Nifedipine XL (Adalat/ Procardia®)	Consider use if patient cannot tolerate diltiazem; Start 30mg daily; usually 30-120mg daily; Caution edema, CHF, and MI
Nisoldipine (Sular®)	Consider use if patient cannot tolerate diltiazem; Start 20mg daily; usually 10-40mg daily; NMT 60mg daily; Caution edema, CHF, and MI

### Alpha Blockers

Doxazosin (Cardura®)	Start 1mg immediate release HS; Max dose 16mg daily; Can cause dizziness, drowsiness, and weakness; Titrate up slowly
Terazosin (Hytrin®)	Start 1mg HS; Max dose 20mg daily; Can cause dizziness, drowsiness, and weakness; Titrate up slowly

### Central Acting

Clonidine (Captopres®)	Start 0.1mg BID; usually 0.1-0.3mg BID; Can cause ↑ sedation/dizziness/weakness; Titrate ↑ slowly. Do <b>not</b> withdraw abruptly
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Drugs names in *italics* are *not* on the IHS National Core Formulary

## Type 2 DM – Lipids

### Step 1: Ensure triglycerides (TG) are not dangerously high

TG > 500

Restrict fats, Intensify blood glucose control, R/O hypothyroidism or other causes.  
Consider: Gemfibrozil, Fish Oil, Niaspan

### Step 2: Check LDL

LDL Goal is < 100

Consider LDL < 70 for known CVD

LDL < 100

Therapeutic Lifestyle Changes

LDL > 100

Start Simvastatin 40mg at bedtime  
If goal LDL not achieved with Simvastatin 80mg, consider switching to Atorvastatin 80mg daily

### Step 3: Check Triglycerides Triglyceride Goal is < 150

TG > 150

Start/Add Fish Oil, Gemfibrozil 600mg BID, or Niaspan 500mg HS

**All Adults with Diabetes > Age 30**  
ASA 81mg daily if no history of CVD

Ref: ADA Clinical Practice Recommendations 2007 & ATP III  
[http://care.diabetesjournals.org/content/vol30/suppl\\_1/](http://care.diabetesjournals.org/content/vol30/suppl_1/)  
<http://www.nhlbi.nih.gov/guidelines/cholesterol/index.htm>

## Type 2 DM – Lipids

Medication	LDL	HDL	TG	Start Dose	Max Dose
<b>Statins</b>					
Simvastatin (Zocor®)	-20-50%	+5-10%	-15-30%	40mg HS	80mg HS
Atorvastatin (Lipitor®)	-20-55%	+5-10%	-15-30%	10-20mg daily	80mg daily
<b>Fibrates</b>					
Gemfibrozil (Lopid®)	-0-20%	+10-25%	-20-35%	600mg BID	
Fenofibrate (Tricor®)	-20%	+9-15%	-20-35%	145mg daily	
<b>Others</b>					
Niacin (Niaspan®)	-5-20%	+10-30%	-10-35%	500mg HS	2-3g HS
Ezetimibe (Zetia®)	-13%	+1-4%	-8-11%	10mg daily	
Cholestevalem (Welchol®)	-15-20%	+3%	+0-5%	3 tab BID or 6 tab daily	
Fish Oil (Omacor®)	+45%	+9%	-45%	4g / day	
Fish Oil (OTC)	+5-10%	+1-3%	-25-40%	2-4g EPA + DHA	

Drugs names in *italics* are *not* on the National Core Formulary

Note: Atorvastatin 80mg is on the formulary while lower doses are not

### Contraindications

**Statins:** active liver disease, ETOH abuse, pregnancy & lactation

**Niacin:** active gout or PUD, active liver disease, pregnancy & lactation

**Gemfibrozil:** active liver disease, gallbladder disease, pregnancy & lactation

### Lab Monitoring

#### ALT

Simvastatin	Baseline, 6 mos then yearly
Simvastatin 80mg	Baseline, 3 mos, 6 mos then yearly
Atorvastatin 80mg	Baseline, 12 weeks, then every 6 mos
Niacin	Baseline, Q 3 mos for 1 year then Q 6 mos
Gemfibrozil	Baseline, Q 3 mos for 1 year then Q 6 mos
Discontinue or restart at lower dosage if ALT > 3 times ULN	
Omacor	Periodic ALT

#### Other Lab Tests – Check CK if muscle pain

Niacin Follow glucose closely; Check uric acid levels at baseline and when dose is stable; may check in patients suspected of gout.

#### Combination Therapy

Fibrates (Gemfibrozil) & Statin: begin with low doses of Simvastatin (5-20mg); obtain baseline CK and recheck if complaints of muscle symptoms.

Other Combinations: Obtain baseline ALT and CK. Follow strictest monitoring guidelines.

## Type 2 DM – Insulin

**STEP 1:** Target Fasting Plasma Glucose with **Basal insulin**  
Fasting Plasma Glucose (FPG) Target = 70-130mg/dl

HS NPH or Long Acting insulin – start 10 units or 0.2 units/kg



Increase dose 2 units every 3 days until FPG is 70 - 130mg/dl

May increase by 4 units every 3 days if FPG is > 180mg/dl

**STEP 2:** Target Pre-Meal Glucose (target one at a time)  
Premeal Glucose Target = 70-130mg/dl

If Pre-lunch glucose > 130mg/dl  
Start 4 units Bolus Insulin before breakfast

Increase Bolus Insulin by 2 units every 3 days

If Pre-supper glucose > 130mg/dl  
Start 4 units Bolus Insulin before lunch  
OR Add/Increase morning NPH

As insulin doses get larger, (over 10 units), begin to change insulin dose by 10-20%

If Bedtime glucose > 140mg/dl  
Start 4 units Bolus Insulin before supper  
OR Increase evening NPH

**STEP 3:** If A1c not at goal: Target Post-Prandial Glucose with **Bolus** premeal insulin  
2 Hour Post-Prandial Glucose Target <160-180mg/dl

Ref: Nathan, Buse, Davidson, et al. Management of Hyperglycemia in Type 2 Diabetes.: a Consensus Algorithm for the Initiation and Adjustment of Therapy. (2006). Diabetes Care 28, 1963-1972

## Type 2 DM – Insulin

### Basal Insulin – longer acting insulin

Insulin	Onset	Peak	Duration
<b>Basal Insulin - Intermediate Acting Insulin</b>			
NPH (Humulin N ®, Novolin N ®)	1-3 hours	6-10 hours	12-20 hours
<b>Basal Insulin – Long Acting Insulin</b>			
<i>Glargine (Lantus ®)</i>	1 hour	None	24 hours
<i>Levemir (Detemir ®)</i>	1 hour	None	12-24 hours

### Bolus Insulin – shorter acting insulin

Insulin	Onset	Peak	Duration
<b>Bolus Insulin – Rapid and Short Acting Insulin</b>			
<i>Lispro (Humalog ®)</i> <i>Aspart (Novolog ®)</i> <i>Glulisine (Apidra ®)</i>	15-30 min	30-90 min	3-5 hours
Regular (Humulin R ®, Novolin R ®)	30-60 min	1-2 hours	5-8 hours

### Premixed Insulin – longer and shorter acting

Use **ONLY** if the patient cannot mix insulin

Insulin	Onset	Peak	Duration
<b>Mixed Insulins</b>			
Humulin, Novolin, Novolog 70/30	30 min	2-4 hours	14-24 hours
<i>Humulin 50/50</i>	30 min	2-5 hours	18-24 hours
<i>Humalog 75/25</i>	15 min	½-2½ hrs	16-20 hours

Drugs names in italics are not on the National Core Formulary

## Type 2 DM – Chronic Kidney Disease

### Stages of Chronic Kidney Disease (CKD)

	1	2	3	4	5
eGFR	> 60	> 60	30-59	15-29	< 15 ml/min
Proteinuria	micro	macro			

### Referrals

Nephrologist: GFR < 60ml/min or sooner if unsure of etiology of renal disease  
 Nutrition: Refer to RD for consult (protein, Na+, K+, PO<sub>4</sub>, fluids, saturated fat)

### Managing Complications of CKD – Stages 3-5

#### Acidosis

If CO <sub>2</sub> < 22mmol/L	Start sodium bicarbonate 325-650mg (1-2 tabs) TID-QID	Goal: CO <sub>2</sub> ≥ 22mmol/L
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#### Anemia

Check Hb at least yearly: Anemia = Hb <13.5 g/dL adult men, <12 g/dL adult women  
 Consider r/o B12/folate deficiency, GI blood loss, other causes

Baseline Labs: Ferritin, transferrin % sat, iron studies (Fe, % Sat, TIBC), and CBC with diff

Start oral iron therapy if ferritin/iron studies low

Ferrous Sulfate (FeSO<sub>4</sub>) 325mg daily to TID

Consider docusate 100mg BID to reduce constipation

Monitor ferritin to avoid iron overload

Consider IV iron if needed (see iron protocol)

Consider erythropoiesis stimulating agents (ESA) for Hb < 10 (see epo protocol)

Dose ESA to maintain Hb > 10.5 and < 12

#### Diabetes & Cardiovascular Disease (CVD)

Blood sugar control—as renal fxn declines pts' BGs often improve—titrate meds down as needed.

D/C metformin when Creatinine >1.5 men or >1.4 women

Insulin usually the only/main medication used for patients with CKD

Peripheral Neuropathy: Foot ulcers common, check feet each visit, refer to shoe clinic

Retinopathy: Ophth/retinal visits regularly

Autonomic Neuropathy: Frequent BP fluctuations, including orthostatic sx.

HTN: BP goal still <130/80; continue ACEI/ARB (watch K+)

CVD: CKD increases CVD risk – patients on aspirin (if no contraindications)

Achieve lipid targets, encourage tobacco cessation

#### Edema/Fluid Overload

Establish patient's dry weight

Titrate furosemide as needed 20-240mg BID (diuresis lasts 6 hours-give AM & mid-day)

Ref: KDOQI/NKF and UK Renal Assoc 4<sup>th</sup> Ed. Clinical Practice Guidelines for Complications of Chronic Kidney Disease

## Type 2 DM – Chronic Kidney Disease

### Metabolic Bone Disease

Phosphorus (PO<sub>4</sub>): if >4.6 mg/dL, start binder (calcium); Refer to RD for dietary PO<sub>4</sub> restriction

Calcium (Ca): target: 8.4-9.5 mg/dL

If <8.4, start/increase calcium supplementation

If >10.2, correct causes (often 2<sup>o</sup> meds, need to hold Ca and/or Vit D/calcitriol)

iPTH: targets - Stage 3: 35-70pg/mL Stage 4: 80-100pg/mL

If iPTH elevated, measure 25(OH)D (Vitamin D)

If 25(OH)D >=30mg/mL, start calcitriol

If 25(OH)D <30mg/mL, start ergocalciferol (Vit D2)

Follow Ca, PO<sub>4</sub>, iPTH, and 25(OH)D (Vitamin D): if Ca or PO<sub>4</sub> above target or if iPTH below target, hold calcitriol and/or calcium

CKD Stage	eGFR	iPTH goal	PO <sub>4</sub> goal	Ca goal	Ca X PO <sub>4</sub>
3	30-59	35-70	2.7-4.6	8.4-9.5	< 55
4	15-29	80-100	2.7-4.6	8.4-9.5	< 55
5	< 15	150-300	3.5-5.5	8.4-9.5	< 55

Medication*	iPTH effect	PO <sub>4</sub> effect	Ca effect	Comments
<b>Phosphate Binders</b>				
CaCO <sub>3</sub> (Oyst-Cal or TUMS) 500-2000mg with meals (no more than 7g/d)	-	↓	↑	Use if Ca < 8.4
Ca Acetate 1334-2868mg with meals	-	↓↓	↑	Use if Ca < 8.4 & PO <sub>4</sub> > 5
Sevelamer (Renagel) 800-1600mg TID	-	↓↓	-	Decrease PO <sub>4</sub> , no effect on Ca
Lanthanum 1500-3750mg/day w/ meals	-	↓↓	↓	Decrease PO <sub>4</sub> and Ca++
Aluminum 600-1200mg TID between meals & HS	-	↓↓	-	ONLY if PO <sub>4</sub> > 7 and Ca x PO <sub>4</sub> > 55; not more than 30 days
<b>Vitamin D and Analogs</b>				
Vit D <sub>2</sub> (Ergocalciferol) 1.25-5mg daily	↓	-	↑↑	Use if Vit D < 30mg/ml
Calcitriol 0.25-1mcg daily or 0.5-3mcg TIW	↓	-	↑↑	Use only if Ca & PO <sub>4</sub> in nl range
Doxercalciferol 1-3mcg daily or 10-20mcg TIW	↓	-	↑	Hold if Ca x PO <sub>4</sub> > 55
<b>Other</b>				
Cinacalcet 30-180mg daily	↓	↓	↓↓	Do not use if Ca < 8.4

\*Always include dietary phosphorus restriction

Drugs in *italics* are not on the IHS National Core Formulary

### Lab Monitoring

Parameter	GFR > 60	GFR 30-59	GFR 15-29	GFR < 15 not on dialysis
Creatinine	Annual	Each visit	Each visit	Each visit
GFR	Annual	Each visit	Each visit	Each visit
Hb	Annual	Q3-4 mos*	Q3-4 mos*	Q3-4 mos*
Serum Fe		Q3-4 mos	Q3-4 mos	Q3-4 mos*
Transferrin Sat		Q3 mos	Q3 mos	Q3 mos*
Ferritin		Q3 mos	Q3 mos	Q3 mos
iPTH		At least annually*	Q3 mos*	Q3 mos*
Ca & PO <sub>4</sub>		At least annually*	Q3 mos*	Q month*

\* Monitor more often if on medications that affect these labs

# Customize them

- Adjust meds to your local formulary
  - Algorithms in Word format
- Send out electronically to all clinical and diabetes staff for feedback
  - Be sure your Nephrology group is on board with CKD card
- Once consensus reached, print cards (laminates?), post electronically on clinic website
- Emphasize algorithms are not “the law”

# Update them

- We will review cards periodically and also add new ones
  - check for updates on DDTP website
- You should also update cards when:
  - you make a significant formulary change
  - when there's a major change in national standards—you don't have to wait til we adjust the cards on the DDTP website!
  - But don't print new cards for every small change—you'll drive staff a little crazy....

# Where to Get All These Tools

- IHS DDTP website:

[www.ihs.gov/MedicalPrograms/Diabetes/](http://www.ihs.gov/MedicalPrograms/Diabetes/)

Algorithms

- 508 compliant text version

- Word file in Algorithm format

- urine protein testing guideline just finished and not yet on website;

email me: [ann.bullock@ihs.gov](mailto:ann.bullock@ihs.gov)

# CKD Testing Issues

# National Kidney Foundation (NKF)

## Definition of CKD

- **Kidney Function.** Glomerular filtration rate (GFR)  $<60$  mL/min/  $1.73$  m<sup>2</sup> for  $\geq 3$  months with or without kidney damage
  - Or--
- **Kidney damage** for  $\geq 3$  months, with or without decreased GFR, manifested by either:
  - Pathologic abnormalities; or
  - Markers of kidney damage, i.e., **proteinuria**

# IHS Best Practices for Diabetes and Kidney Disease: Goals

- Identify, manage and monitor patients with diabetes and CKD (GFR<60 and/or proteinuria)
- Initiate appropriate treatment for anemia, malnutrition, metabolic bone disease, hyperlipidemia
- Provide appropriate nutritional counseling for CKD
- Provide patient education on IHS CKD educational objectives
- Provide appropriate preparation for renal replacement therapy including education on treatment choices, early referral for vascular access and transplantation

# Improving CKD: Bottom line

- Follow eGFR and UACR
- Control blood pressure
- Talk to the patient about CKD

# Urine Albumin Testing: Recipe for Confusion...

- Many different tests:
  - Some based on urine albumin, others on protein
  - Some quantitative, others “test strips”
  - Some require timed urine collections (e.g. 24 hr, 4 hr, overnight), others on spot samples
  - Some protocols call for one test for screening, others for diagnosis and monitoring
  - Most tests not standardized

## Urine Albumin Screening and Monitoring in Type 2 DM

Albuminuria describes a condition in which urine contains an abnormal (high) amount of albumin. In people with Type 2 Diabetes, albumin is the primary protein excreted by the kidneys. Albuminuria is usually a marker of nephropathy and CVD. High levels and/or a rapid rise in urine albumin may be a sign of serious kidney disease. Not all kidney disease in people with diabetes is diabetic nephropathy; consider other causes of kidney damage.

The "gold standard" for kidney testing in people with diabetes = UACR and eGFR

### Assessing Urine Albumin in Type 2 DM

1. **Screen:** Check UACR at diagnosis of Type 2 DM and yearly
2. **Diagnosis:** positive diagnosis albuminuria if UACR is greater than 30mg/g on 2 separate occasions
3. **Monitor:** Recheck UACR every year  
*More frequent monitoring may be needed in patients with changing clinical status or after therapeutic interventions. (Do not monitor urine albumin in dialysis patients)*

### When you should NOT screen for proteinuria:

Do not screen if symptoms of UTI or a UA that is positive for leukocytes, nitrite, or RBC. Address these issues first, then screen for urine protein once resolved  
Causes of false positives include: strenuous exercise within 24 hours, infection, fever, CHF, marked hyperglycemia, pregnancy, marked hypertension, UTI, and hematuria.

### Management of Albuminuria

The following strategies should be implemented to reduce albuminuria, prevent/slow nephropathy progression, and lower the risk of CVD:

Maximize ACE inhibitor/ARB	BP Control
Stop smoking	Lipid Control
Protein restriction (later stages)	Glucose Control

Repeat UACR to monitor effectiveness of intervention; a decrease in urine albumin is therapeutically significant

## Urine Albumin Tests

### 1. Urine Albumin: Creatinine Ratio (UACR)

- UACR measures Albumin excretion in: mg albumin/g creatinine
- Run on a spot urine sample; timed samples not necessary. This test accounts for variation in urine concentration
- Good at assessing any level of proteinuria
- Values can be used for screening, diagnosing, and monitoring interventions, for guiding therapy
- Requires lab analysis; Currently no CLIA waived POC test

The "gold standard" for urine albumin testing = UACR

### Other urine protein tests

*These tests are not recommended for assessing albuminuria*

### 2. Urine Protein: Creatinine Ratio (UPCR)

- Not sensitive for early detection; not standardized

### 3. 24 hour urine collection for protein

- Labor intensive for patients and is difficult to get a complete and accurate sample; no more effective than simpler tests such as UACR for DM nephropathy

### 4. Microalbumin:Creatinine strips (e.g. Clinitek)

- Results may look like UACR (mg alb /g creatinine) but less accurate
- Local lab test names vary widely; Talk with your lab on how to order a UACR (and not a test strip).

### 5. Microalbumin strips (e.g. Micral)

- Less accurate; resulted as mg alb/L

### 6. UA dipstick

- Only detects higher levels of proteinuria (>300mg/g)
- Not precise and cannot be used to assess or monitor albuminuria in Type 2 Diabetes

*This year's Diabetes Audit will still count any type of urine protein screening, but UACR is preferred*

Albuminuria is a continuous variable, the terms "microalbuminuria" and "macroalbuminuria" are going out of use.

Since these terms are still used for ICD9 Coding:

Normal	= < 30mg/g
Microalbuminuria	= 30 - 300mg/g
Macroalbuminuria	= > 300mg/g

# 2010 Diabetes Audit Form

## Urine Protein Testing during audit period

URINE TESTED FOR PROTEIN:

1 Yes 3 Refused

2 No

SPECIFIC TESTING DONE:

1 Urine Albumin:Creatinine Ratio

UACR value: \_\_\_\_\_ mg/g

2 Urine Protein:Creatinine Ratio

UPCR value: \_\_\_\_\_ g/g

3 24 hr urine collection for protein

Result: \_\_\_\_\_ mg

4 Microalbumin:creatinine strips (e.g., Clinitek)

Select result:

1 <30 mg/g

2 30-300 mg/g

3 >300 mg/g

5 Microalbumin strips (e.g., Micral)

Select result:

1 < 20 mg/L

2 > 20 mg/L

6 UA dipstick

Select result:

1 Normal or trace

2 Abnormal ( $\geq 1+$ )

# Advances in Indian Health Conference

- 10<sup>th</sup> year of IHS' primary care conference
- April 27-30, 2010 at Sheraton Uptown Albuquerque, NM
- 28 hours of CME/CE
  - Diabetes track sponsored by DDTP
  - Mental Health, Substance Abuse, Women's Health, EHR, CKD, Geriatrics, Pediatrics, Tobacco Cessation, Oral Health
  - Sessions on: Adverse Childhood Experiences, Trauma/Historical Trauma
- UNM Office of CME website:  
[hsc.unm.edu/cme/](http://hsc.unm.edu/cme/)