# *Intermediate Outcomes*

What are intermediate outcomes? Intermediate outcomes measure whether interventions resulted in improvements in risk factors for the onset of diabetes complications and include clinical measures, such as blood sugar control, blood pressure control, protein in the urine, cardiovascular disease risk factors, and Body Mass Index (a measure of overweight and obesity).

**The IHS National Diabetes Program was able to measure intermediate outcomes in its evaluation of the Special Diabetes Program for Indians.**

The IHS National Diabetes Program was able to measure intermediate outcomes in its evaluation of the Special Diabetes Program for Indians.

This section includes data on the following categories of intermediate outcomes:

- Glycemic (blood sugar or blood glucose) control
- Blood pressure control
- Protein in the urine (proteinuria)
- Cardiovascular disease risk factors
- Body Mass Index (a measure of overweight and obesity)

This section includes data on the following specific **intermediate outcomes**:

**Control of blood glucose steadily improved** with implementation of the Special Diabetes Program for Indians. A1C levels: 1996-2002 (p. 92)

**Blood pressure control steadily improved** with implementation of the Special Diabetes Program for Indians. Diastolic blood pressure levels: 1997-2002 (p. 93)

**Total cholesterol levels steadily improved** with implementation of the Special Diabetes Program for Indians. Total cholesterol levels: 1997–2002 (p. 94)

**Control of triglyceride levels steadily improved** with implementation of the Special Diabetes Program for Indians. Triglyceride levels: 1997-2002 (p. 95)

**Control of LDL cholesterol (the "bad" cholesterol) steadily improved** with implementation of the Special Diabetes Program for Indians. Mean LDL Levels: 1998-2002 (p. 96)

Treatment to **prevent and delay the progression of diabetic kidney disease has improved** since implementation of the Special Diabetes Program for Indians. Risk of diabetic kidney disease: 1997-2002 (p. 97)

Certain diabetes program elements implemented with SDPI were associated with **improved Body Mass Index (BMI) control**. (p. 98)

**Treatment of risk factors for cardiovascular disease improved** since implementation of the Special Diabetes Program for Indians. Cardiovascular risk factors: 1997-2001 (p. 100)

Certain diabetes program elements implemented with SDPI were associated with **better blood pressure control**. (p. 102)

Certain diabetes program elements implemented with SDPI were associated with **better triglyceride level control**. (p. 103)

**Treatment to prevent and delay progression of diabetic eye disease have improved** since implementation of the Special Diabetes Program for Indians. Diabetic eye exams: 1997-2002 (p. 104)

Certain diabetes program elements implemented with SDPI were associated with **better glycemic control**. (p. 106)

Certain diabetes program elements implemented with SDPI were associated with **better cholesterol level control**. (p. 108)

Certain diabetes program elements implemented with SDPI were associated with **better LDL cholesterol level control**. (p. 110)

Providing **individualized medical nutrition therapy services** to patients with diabetes improves A1C levels. (p. 112)

# Chapter Four
## Outcomes

**"I eat low-fat protein and limited carbohydrates. I have energy all day long. My blood sugar level averages about 115. I really don't know what to do with all this extra energy. Maybe I could sell some. Do you have a dirty house or car for me to clean?"**

Robert Chasing Hawk (Cheyenne River Sioux)

## Intermediate Outcomes

## ***Control of blood glucose steadily improved*** *with implementation of the Special Diabetes Program for Indians.*

*A1C levels: 1996–2002*

**"My cholesterol is under 200. My triglycerides are under 200. My hemoglobin A1C is 7.2. I've learned it's important to keep track of all this."**

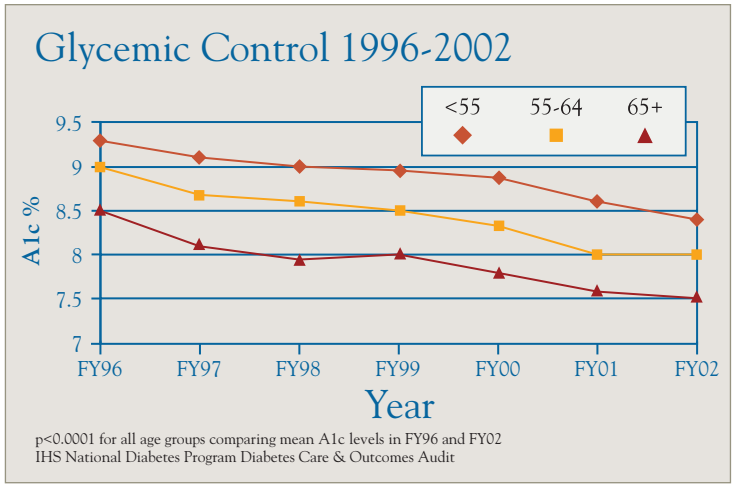
Eldean Cutschall (Oglala Sioux)

### *Why is this important?*

Large clinical studies have shown that better glycemic control (i.e., better blood sugar or blood glucose control) reduces the complications of diabetes.[42] High A1C levels indicate poor glycemic control, whereas low A1C levels indicate better control (6% and below is considered normal glycemic control).

A 1% decrease in absolute level A1C translates into a:

- 14% decrease in total mortality
- 21% decrease in diabetes-related deaths
- 14% decrease in myocardial infarction
- 40% decrease in eye disease
- 12% decrease in strokes
- 43% decrease in amputations
- 24% decrease in kidney failure
- $800 per person per year reduction in health care costs




Since 1996, AI/ANs with diabetes experienced a steady improvement in glycemic control, as shown by a decrease in mean A1C level, for all age groups.

## ***Blood pressure control steadily improved*** *with implementation of the Special Diabetes Program for Indians.*

*Diastolic blood pressure levels: 1997–2002*

### *Why is this important?*

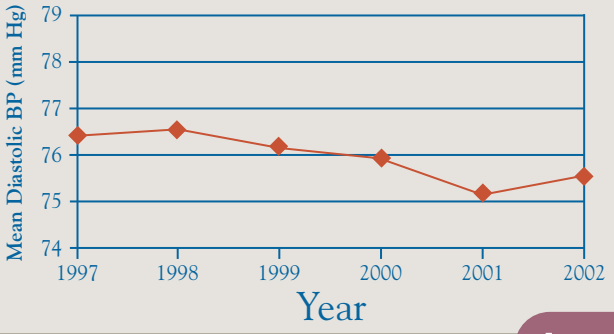
Lower blood pressure levels in people with diabetes reduce the risk of heart disease and stroke by 33–50%. Blood pressure control reduces the risk of eye, kidney, and nerve disease by 33%.[43]

National standards recommend that people with diabetes keep their blood pressure below certain levels:

- Systolic blood pressure below 130 mm Hg
- Diastolic blood pressure below 80 mm Hg



Mean Diastolic Pressure 1997-2002




Overall p<0.05, between years 1997 and 2002
IHS National Diabetes Program
Diabetes Care & Outcomes Audit
Adjusted for age, sex, duration of diabetes, body mass index, and age

Since 1997, blood pressure control among AI/ANs with diabetes has improved, as shown by a steady decrease in mean diastolic blood pressure.



**"My blood pressure reading was 128/80. That's good. That's right where it should be."**

Sandra Charnoski, right, with Brian Brunelle (Red Lake Ojibwe)

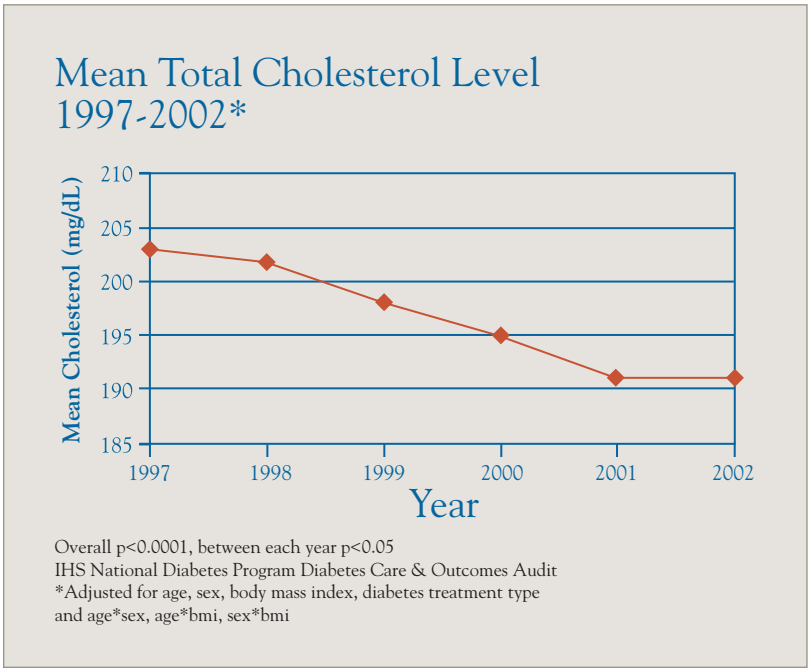
## ***Control of mean total cholesterol levels has steadily improved*** *with implementation of the Special Diabetes Program for Indians.*

*Total cholesterol levels: 1997–2002*

### *Why is this important?*

Improved control of cholesterol levels is known to reduce the risk of cardiovascular complications by 20–50%.[44]

National standards recommend that people with diabetes keep their cholesterol levels below 200 mg/dl.




Since 1997, cholesterol control in AI/ANs with diabetes has significantly improved, as shown by a steady decrease in mean total cholesterol levels (203 mg/dl in 1997 vs. 191 mg/dl in 2002; p<0.0001).

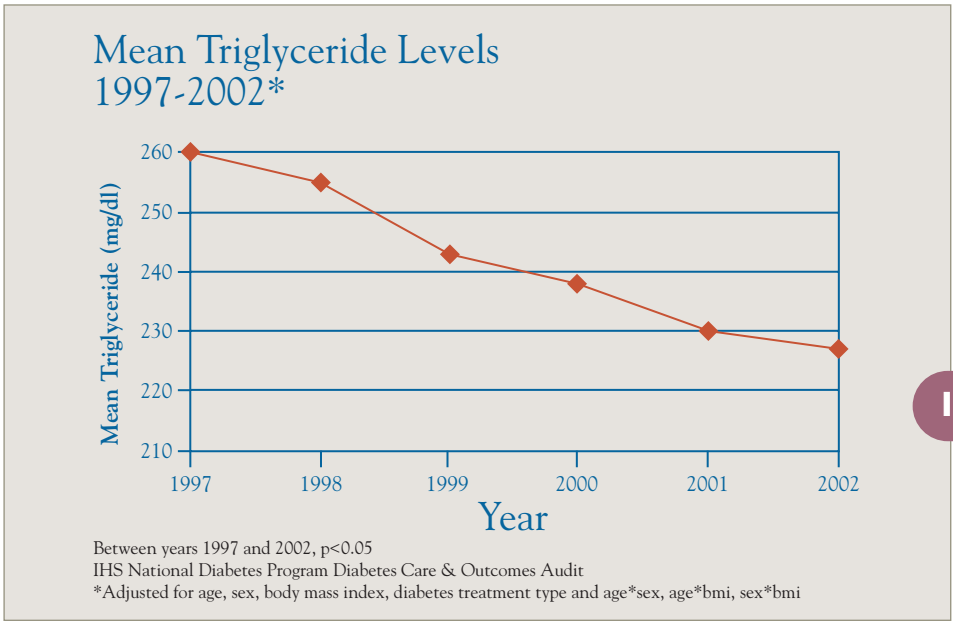
## ***Control of triglyceride levels steadily improved*** *with implementation of the Special Diabetes Program for Indians.*

*Triglyceride levels: 1997–2001*

### *Why is this important?*

Improved control of triglyceride levels reduces the risk of cardiovascular complications by 20–50%.[45]

National standards recommend that people with diabetes keep their triglyceride levels below 150 mg/dl.




Since 1997, triglyceride control in AI/ANs with diabetes has significantly improved, as shown by a decrease in mean triglyceride levels (260 mg/dl in 1997 vs. 227 mg/dl in 2002).

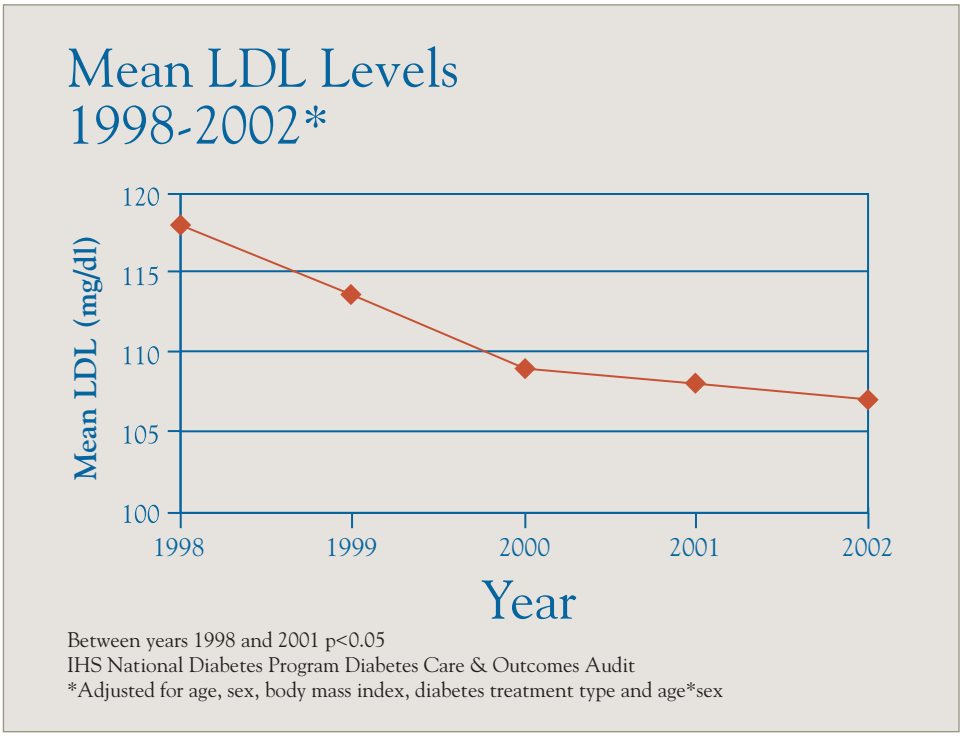
## ***Control of LDL cholesterol (the "bad" cholesterol) steadily improved*** *with implementation of the Special Diabetes Program for Indians.*

*Mean LDL Levels: 1998–2002*

### *Why is this important?*

Improved control of LDL cholesterol levels in people with diabetes reduces the risk of cardiovascular disease by 20–50%.[46]

National standards recommend that people with diabetes keep their LDL cholesterol levels below 130 mg/dl and ideally below 100 mg/dl.




Since 1998, cholesterol control in AI/ANs with diabetes has significantly improved, as shown by a steady decrease in mean LDL cholesterol level (118 mg/dl in 1998 vs. 107 mg/dl in 2002).

## ***Treatment to prevent and delay the progression of diabetic kidney disease has improved*** *since implementation of the Special Diabetes Program for Indians.*

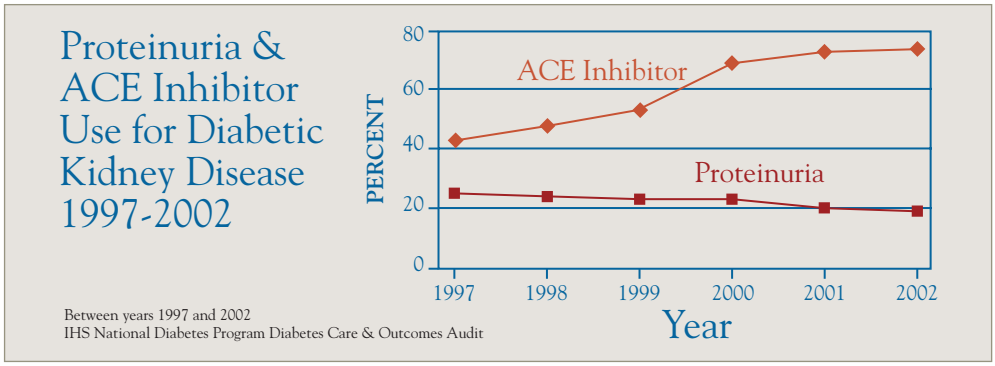
*Risk of diabetic kidney disease: 1997–2002*

### *Why is this important?*

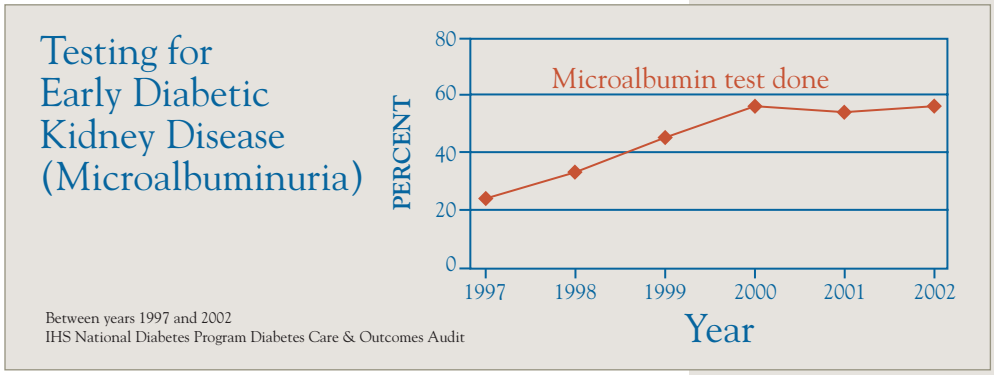
- Proteinuria (i.e., protein measured in the urine with a urinalysis test) is a marker for diabetic kidney disease.
- Small amounts of protein in the urine, known as microalbuminuria, appear very early in diabetic kidney disease and may indicate a point at which diabetic kidney disease is reversible.
- Medications called ACE inhibitors have been shown to reverse proteinuria and microalbuminuria and to delay the progression of diabetic kidney disease.[47]







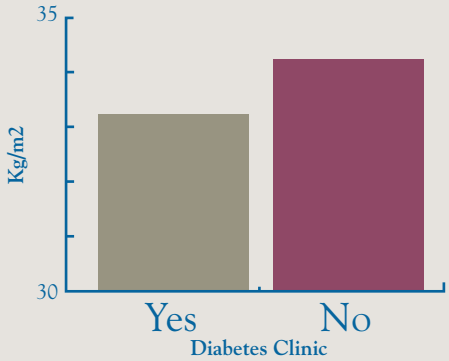

Since 1997, the prevalence of proteinuria in AI/ANs has decreased (from 25% in 1997 to 19% in 2002) as ACE inhibitor use has increased (from 42% in 1997 to 74% in 2002). It is likely that these two trends are related since ACE inhibitors have been shown to reverse proteinuria and delay progression of kidney failure.




Since 1997, more diabetes grant programs tested for microalbuminuria (from 24% in 1997 to 56% in 2002) to find very early cases of diabetic kidney disease that may be reversible.

*Certain diabetes program elements implemented with SDPI were associated with* ***improved Body Mass Index (BMI) control.***

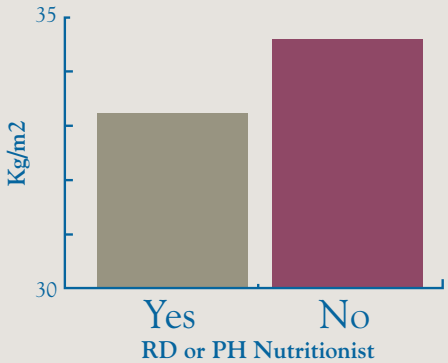
## Diabetes Clinic and Mean BMI Levels Among Grant Programs*




*Adjusted for age, sex, duration of diabetes
p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 1997-2002

Patients in diabetes grant programs that established a diabetes clinic had significantly lower mean BMIs than patients in programs that did not (mean BMIs of 33.2% vs. 34.2%, respectively).

## Having a Registered Dietitian or Public Health Nutritionist & Diabetes Team on Mean BMI Levels Among Grant Programs*




*Adjusted for age, sex, duration of diabetes
p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 1997-2002

Patients in diabetes grant programs that included a Registered Dietitian or Public Health Nutritionist on their diabetes team had significantly lower mean BMIs than patients in programs that did not (mean BMIs of 33.2% vs. 34.6%, respectively).

## *Why is this important?*

Body Mass Index (BMI) is a simple measure of weight in relation to height. The National Institutes of Health recommends the BMI as an objective indicator of whether a person is obese (BMI >30), overweight (BMI 25–30), underweight (BMI <20), or at a healthy weight (BMI 20–25). Most individuals with type 2 diabetes are overweight or obese. These conditions negatively affect insulin resistance, glycemic (i.e., blood sugar or blood glucose) control, blood pressure control, and blood lipid control. Weight loss is important for decreasing insulin resistance, improving glycemic control, reducing blood pressure, and improving blood lipid control.

Diabetes grant programs chose to implement certain elements of diabetes care. These elements are believed to result ultimately in improved outcomes, such as reduction in overweight and/or obesity, as measured by BMI level.

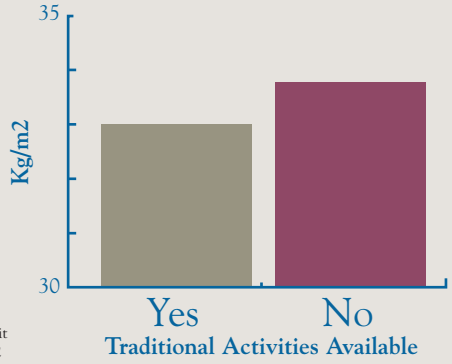
Our analysis found significantly lower BMI levels for patients who received care in programs with some of these program elements:

- Diabetes clinics
- Diabetes teams with Registered Dietitians or Public Health Nutritionists
- Traditional food and nutrition programs
- Nutrition education budgets

Blackfeet women reduced their Body Mass Index by weight training which helps build fat-burning muscle mass.



## Having Traditional Food & Nutrition Activities for People with Diabetes & Mean BMI Levels Among Grant Programs*

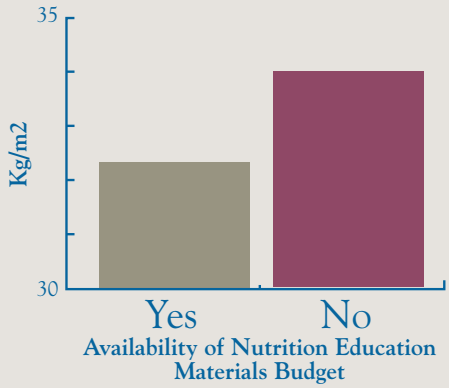



*Adjusted for age, sex, duration of diabetes,
p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit
and IHS National Diabetes Program SDPI Evaluation, 1997-2002

Patients in diabetes grant programs that established traditional food and nutrition activities for people with diabetes had significantly lower mean BMIs than patients in programs who did not (mean BMIs of 33.0% vs. 33.8%, respectively).

**Intermediate Outcomes**

## Availability of Nutrition Education Materials Budget & Mean BMI Levels Among Grant Programs*




*Adjusted for age, sex, duration of diabetes,
p<0.003 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit
and IHS National Diabetes Program SDPI Evaluation, 1997-2002

Patients in diabetes grant programs with a nutrition education budget had significantly lower mean BMIs than patients in programs that did not (mean BMIs of 32.3% vs. 34.0%, respectively).

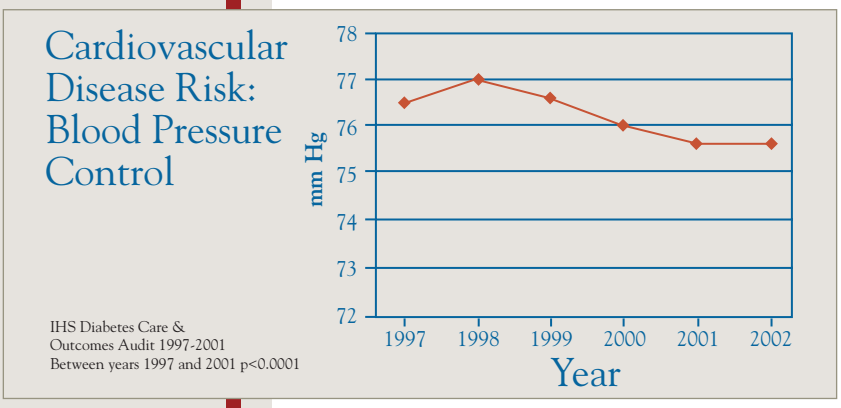
## ***Treatment of risk factors for cardiovascular disease improved*** *since implementation of the Special Diabetes Program for Indians.*

*Cardiovascular risk factors: 1997–2001*

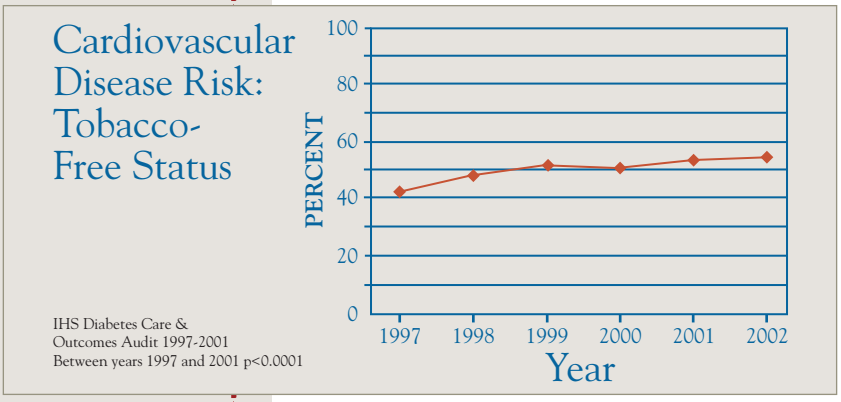
### *Why is this important?*

Cardiovascular disease (CVD) is the leading cause of death among AI/ANs with diabetes. While CVD mortality is *decreasing* in the general U.S. population, it is actually *increasing* in the AI/AN population. The Strong Heart Study, a study of heart disease among AI/ANs, demonstrated that CVD rates are higher in both AI/AN men and women than in the general U.S. population. The Strong Heart Study also demonstrated that 56–78% of all CVD events in AI/AN occur in people with diabetes.[48]

Many studies have shown that treating risk factors can reduce CVD in people with diabetes. Simple interventions, such as blood pressure control, LDL reduction, aspirin use, and tobacco cessation, can significantly reduce the risk of CVD.[49]




Blood pressure control in people with diabetes is associated with a lower risk of CVD. Since 1997, blood pressure control in AI/ANs with diabetes has improved, as shown by a steady decrease in mean diastolic blood pressure level (the systolic blood pressure remained unchanged).



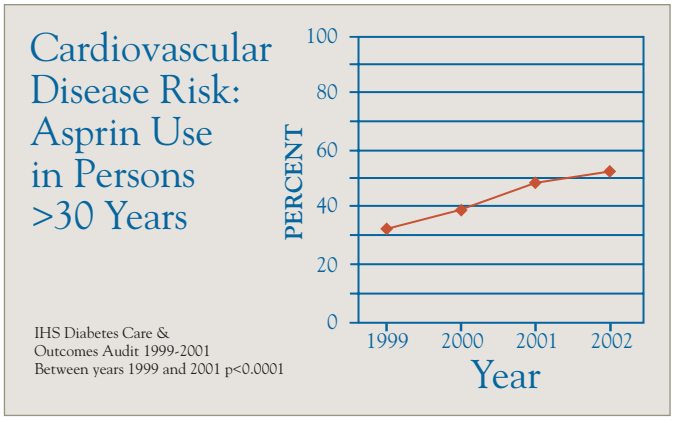

People with diabetes who are tobacco-free have a lower risk of CVD. Since 1997, the proportion of AI/ANs with diabetes that do not use tobacco has improved, as shown by a steady increase in individuals who are tobacco-free.

"Diabetes and heart disease run in my family. I have diabetes, and have had heart surgery. When I learned how bad smoking is, I quit. I haven't smoked for over a year."

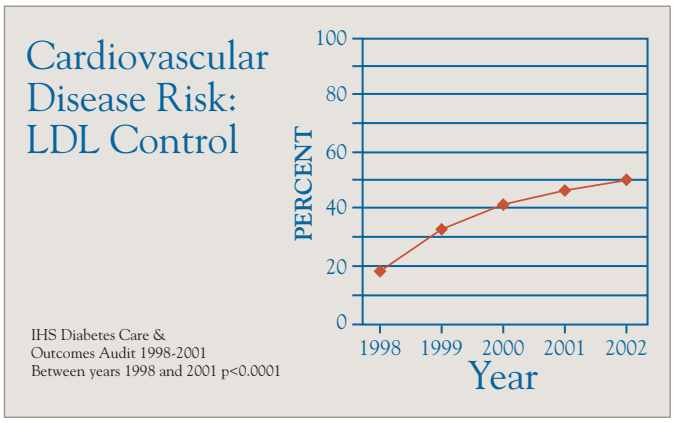
Maxine White (Omaha Sioux)

CHAPTER FOUR
Outcomes

## Intermediate Outcomes




Aspirin use in people with diabetes is associated with a lower risk of CVD. Since 1999, aspirin use in AI/ANs with diabetes has improved, as shown by a steady increase in the proportion of individuals on aspirin.




LDL cholesterol control in people with diabetes is associated with a lower risk of CVD. Since 1998, LDL cholesterol control in AI/ANs with diabetes has improved, as shown by a steady increase in the proportion of individuals with values of LDL less than 130 mg/dl.

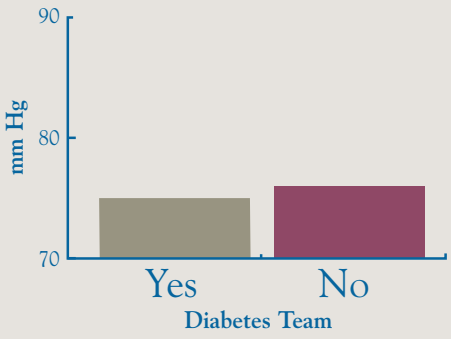
*Certain diabetes program elements implemented with Special Diabetes Program for Indians were associated with* ***better blood pressure control.***

## *Why is this important:*

Diabetes grant programs chose to implement certain elements of diabetes care. These elements are believed to result ultimately in improved outcomes, such as blood pressure control as measured by mean blood pressure. As shown in this series of slides, our analysis found significantly lower mean diastolic blood pressures for patients who received care in programs with at least one of these program elements:

- Diabetes team
- Diabetes clinic
- Use of ACE inhibitors

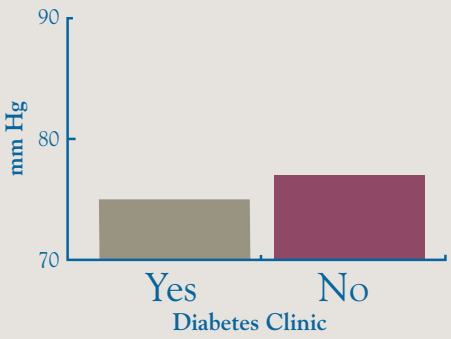
### Diabetes Team & Mean Diastolic Blood Pressure Levels* Among Grant Programs




*Adjusted for age, sex, duration of diabetes, BMI
p<0.001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that established a diabetes team had significantly lower mean diastolic blood pressure levels than patients in programs that did not (mean diastolic blood pressure levels of 75mm Hg vs. 76 mm Hg, respectively).

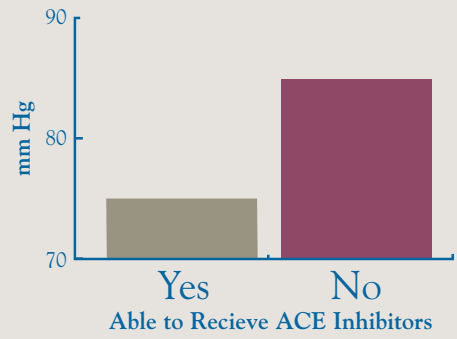
### Diabetes Clinic on Mean Diastolic Blood Pressure Levels* Among Grant Programs




*Adjusted for age, sex, duration of diabetes, BMI
p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that established a diabetes clinic had significantly lower mean diastolic blood pressure levels than patients in programs that did not (mean diastolic blood pressure levels of 75 mm Hg vs. 77 mm Hg, respectively).

### ACE Inhibitors for People with Diabetes & Mean Diastolic Blood Pressure Levels* Among Grant Programs

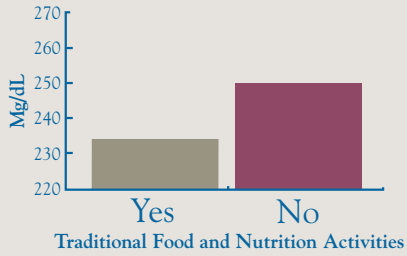



*Adjusted for age, sex, duration of diabetes, BMI
p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that had widespread availability of ACE inhibitors had significantly lower mean diastolic blood pressure levels than patients in programs that did not (mean diastolic blood pressure levels of 75 mm Hg vs. 85 mm Hg, respectively).

*Certain diabetes program elements implemented with Special Diabetes Program for Indians were associated with* ***better triglyceride level control.***

## Having Medical Nutrition Therapy Services in Clinic & Mean Triglyceride Levels* Among Grant Programs




*Adjusted for age, sex, BMI • p<0.03 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

The diabetes grant programs that offered Medical Nutrition Therapy had significantly lower mean triglyceride levels than programs that did not (mean triglyceride levels of 234 mg/dl vs. 250 mg/dl, respectively).

## *Why is this important:*

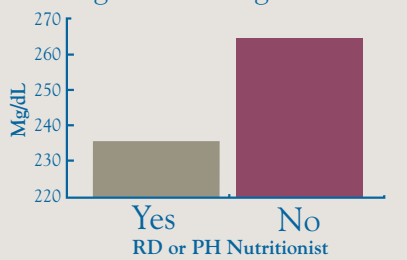
Diabetes grant programs chose to implement certain elements of diabetes care. These elements are believed to result ultimately in improved outcomes, such as triglyceride level control.

Our analysis found significantly lower mean triglyceride levels for patients who received care in programs with at least one of these program elements:

- Medical Nutrition Therapy
- Diabetes teams with Registered Dietitians and Public Health Nutritionists
- Traditional foods and nutrition programs



## Having a Registered Public Health Nutritionist & Diabetes Team on Mean Triglyceride Levels* Among Grant Programs

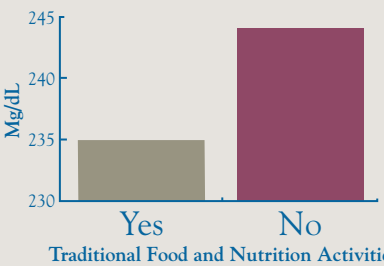



*Adjusted for age, sex, BMI • p<0.002 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

The diabetes grant programs that included a Registered Dietitian or Public Health Nutritionist on their diabetes team had significantly lower mean triglyceride levels than programs that did not (mean triglyceride levels of 236 mg/dl vs. 264 mg/dl, respectively).

Patients in diabetes grant programs that established traditional food and nutrition activities had significantly lower mean LDL cholesterol levels than patients in programs that did not (mean LDL cholesterol levels of 235 mg/dl vs. 244 mg/dl, respectively).

## Effect of Having Traditional Food Activities on Mean Triglyceride Levels* among Grant Programs




*Adjusted for age, sex, BMI • p<0.05 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

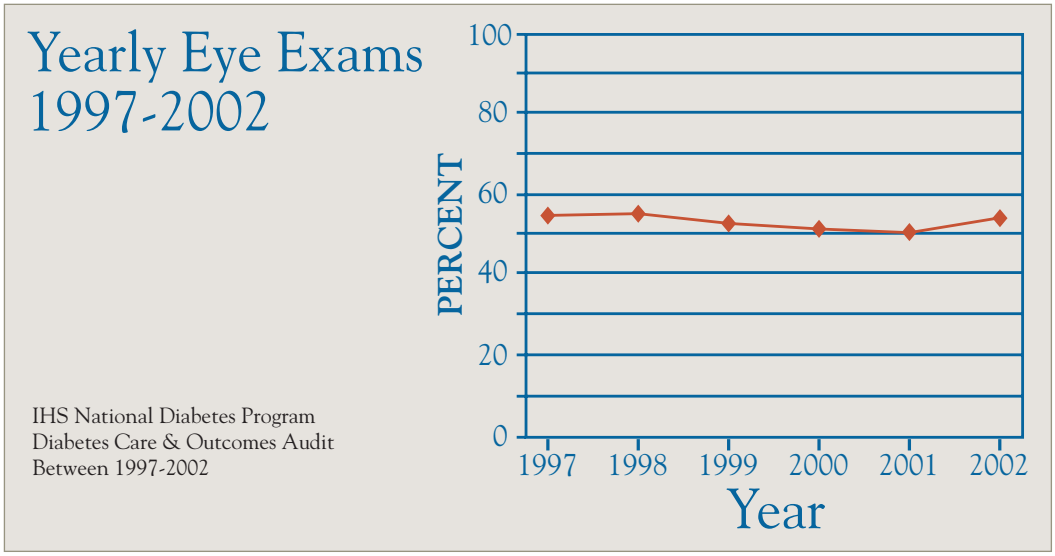
## ***Treatment to prevent and delay progression of diabetic eye disease has improved*** *since implementation of the Special Diabetes Program for Indians.*

*Diabetic eye exams: 1997–2002*

### *Why is this important?*

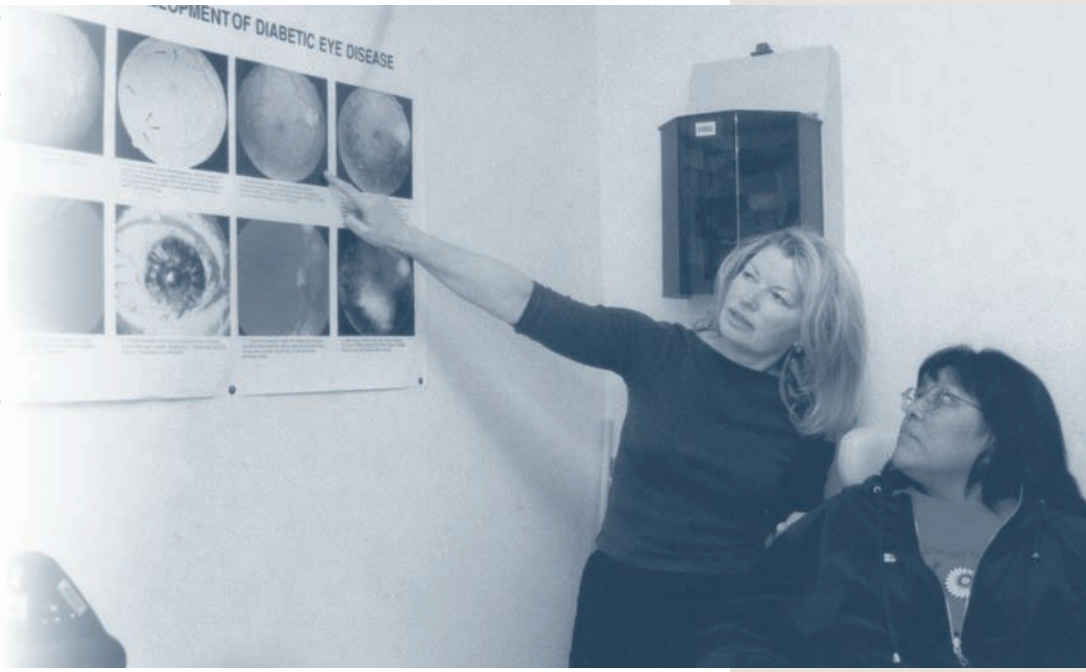
Diabetic eye disease is the leading cause of new blindness in adults. Since diabetic eye disease is a "silent disease," yearly eye exams by an eye professional are needed to find the disease early enough to treat. Treating diabetic eye disease with laser therapy can reduce the development of severe vision loss by 50–60%.[50]

While overall eye exam rates in the IHS have not changed significantly over time, an innovative strategy was implemented recently and is associated with increased eye exam rates. In 1998, Congress directed the IHS to work with the Joslin Diabetes Center to explore the use of telemedicine to improve diabetic eye exam rates in AI/AN communities. Using the funds provided by Congress, the IHS National Diabetes Program has collaborated with the Joslin Vision Network (JVN), a teleophthalmology program that facilitates the diagnosis, management, and treatment of diabetic eye disease.



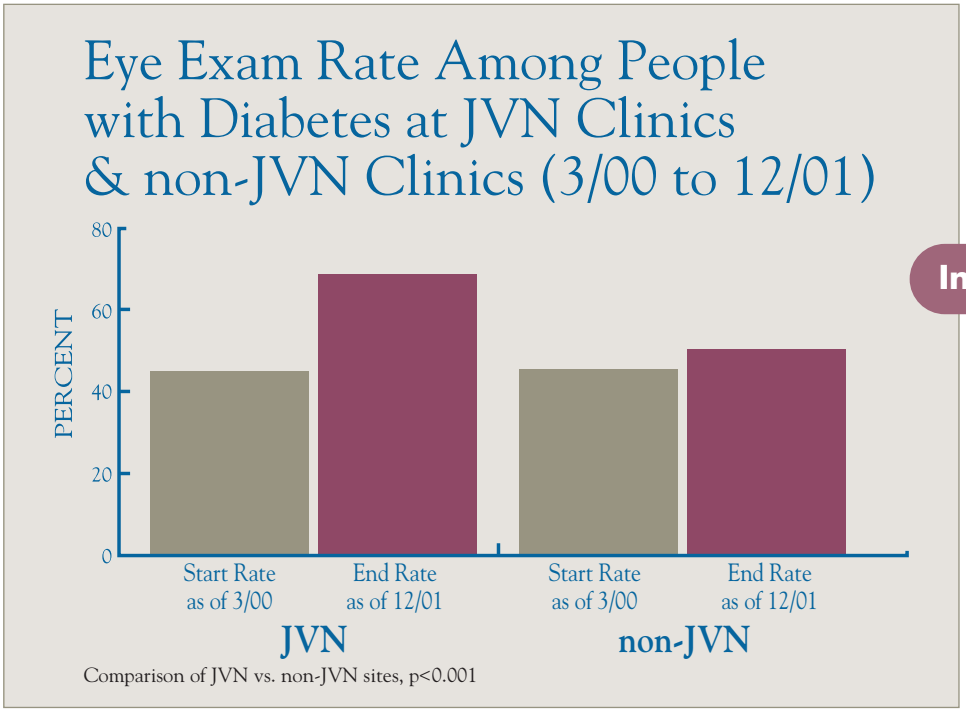

Since 1997, rates of yearly diabetic eye exams have remained the same in AI/AN communities, in spite of efforts to increase them.

Marie Toya (Jemez Pueblo) knows that regular eye checks will help her keep her eyesight. She gets her eyes checked at the clinic at the Jemez Pueblo once a year. Marie participates in the pueblo's aerobics class or walks for exercise. She has switched from cooking with lard to cooking with vegetable oil. And she has cut back on food portions. These changes have helped her gain control of her blood sugar, and avoid eye problems. "I don't have any vision problems," she says.






## Intermediate Outcomes




From March 2000 to December 2001, diabetic eye exam rates improved at the sites where JVN was established as compared with the sites where JVN was not established. Diabetic eye exam rates increased significantly from 45% to 69% at JVN sites, whereas exam rates did not change (46% to 51%) at non-JVN sites. More JVN sites will be established in the Indian health system in 2003.

*Certain diabetes program elements implemented with the Special Diabetes Program for Indians were associated with* ***better glycemic control.***

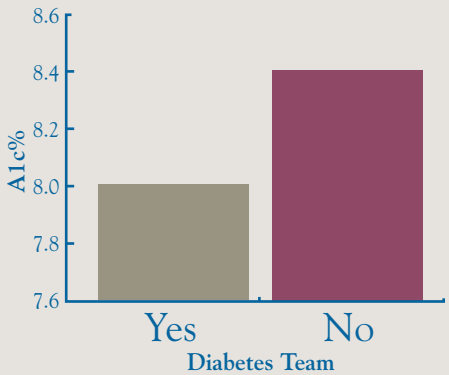
**Patients in grant programs with a diabetes team had lower A1C compared to patients in programs that did not have a diabetes team.**

## *Why is this important:*

Diabetes grant programs chose to implement different elements of diabetes care. These elements are believed to result ultimately in improved outcomes, such as glycemic control, as measured by A1C. In this series of slides our analysis found significantly lower A1C levels for patients who received care in programs with at least one of these program elements:

- Diabetes team
- Availability of organized diabetes education programs
- Availability of culturally appropriate diabetes materials
- Diet instruction by a registered dietitian
- Blood glucose self-monitoring

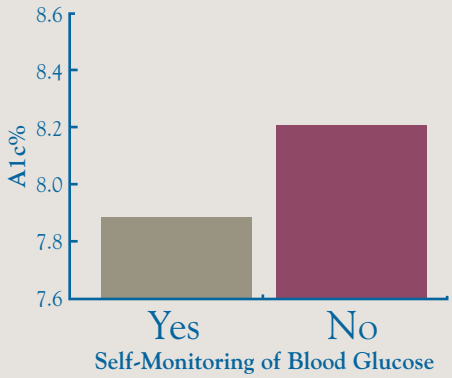
### Diabetes Team & Mean A1C Levels* Among Grant Programs




*Adjusted for age, sex, duration of diabetes, treatment type, p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 1997-2002

Lower A1C levels indicate better glycemic control. The diabetes grant programs that established a diabetes team had significantly lower mean A1C levels than programs that did not (mean A1C levels of 8.0% vs. 8.4%, respectively).

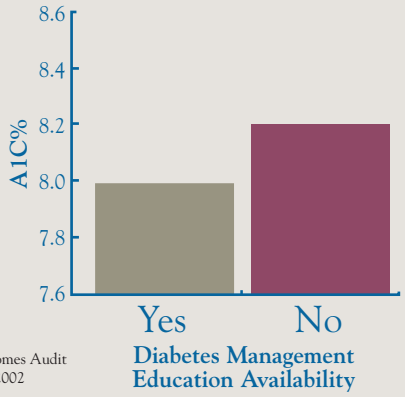
### Self-Monitoring of Blood Glucose on Mean A1C Levels* Among Grant Programs




*Adjusted for age, sex, duration of diabetes, treatment type, p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation 1997-2002

The diabetes grant programs that implemented blood glucose self-monitoring programs had significantly lower mean A1C levels than programs that did not (mean A1C levels of 7.9% vs. 8.2%, respectively).

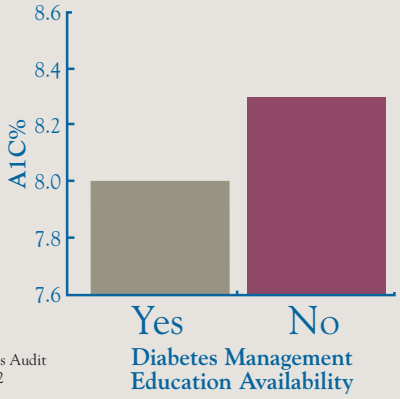
## Availability of Organized Diabetes Education Programs & Mean A1C Levels* Among Grant Programs




*Adjusted for age, sex, duration of diabetes, treatment type
p<0.05 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

The diabetes grant programs that implemented organized diabetes education programs had significantly lower mean A1C levels than programs that did not (mean A1C levels of 8.0% vs. 8.2%, respectively).

## Availability of Culturally Appropriate Diabetes Materials & Mean A1C Levels* Among Grant Programs

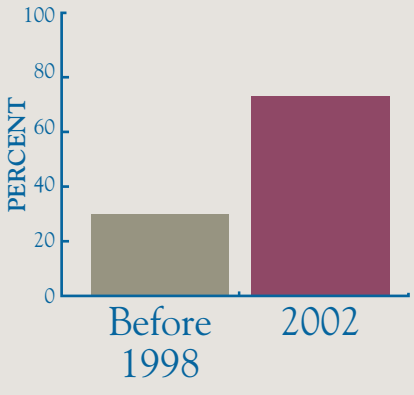



*Adjusted for age, sex, duration of diabetes, treatment type
p<0.05 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

The diabetes grant programs that provided culturally appropriate diabetes materials had significantly lower mean A1C levels than programs that did not (mean A1C levels of 8.0% vs. 8.3%, respectively).



## Registered Dietitian or Public Health Nutritionist on Diabetes Team




Before 1998 vs 2002, p<0.001
IHS National Diabetes Program SDPI Evaluation, 1997-2002

Diabetes grant programs used funding to increase the numbers of Registered Dietitians (RDs) and Public Health Nutritionists (PHNs) on their diabetes teams. In 2002, 72% of the diabetes grant programs reported the addition of RDs or PHNs to their diabetes teams as compared with 30% before the SDPI.

*Certain diabetes program elements implemented with Special Diabetes Program for Indians were associated with* ***better cholesterol level control****.*

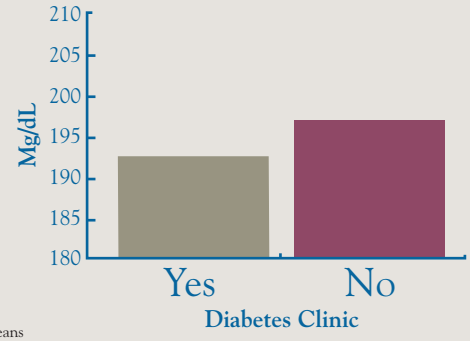
## *Why is this important:*

Grant programs chose to implement different elements of diabetes care. These elements, such as cholesterol control, are believed to ultimately result in improved outcomes, as measured by total cholesterol level.

Our analysis found significantly lower mean cholesterol levels for patients who received care in programs with at least one of these program elements:

- diabetes clinic
- diabetes education programs,
- culturally appropriate diabetes education materials, and
- recreation, wellness, fitness and facilities.

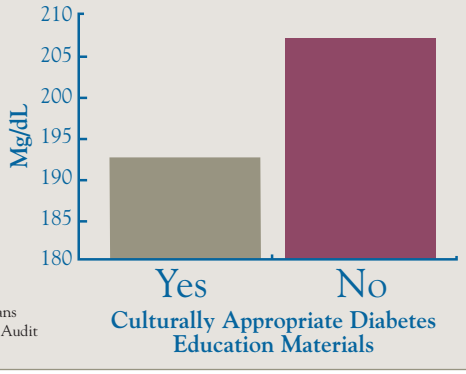
### Having a Diabetes Clinic & Mean Cholesterol Levels*




*Adjusted for age, sex
p<0.005 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit
and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in grant programs that established a diabetes clinic had significantly lower mean total cholesterol levels than patients in programs that did not (mean total cholesterol levels of 193 mg/dl vs. 197 mg/dl, respectively).

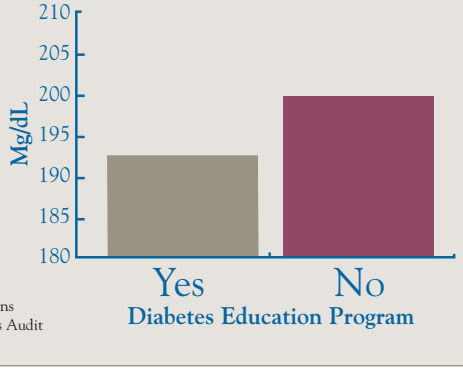
## Having Access to Appropriate Diabetes Education Materials & Mean Cholesterol Levels*




*Adjusted for age, sex • p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that provided culturally appropriate diabetes materials had significantly lower mean total cholesterol levels than patients in programs that did not (mean total cholesterol levels of 193 mg/dl vs. 207 mg/dl, respectively).

## Having a Diabetes Education Program & Mean Cholesterol Levels*

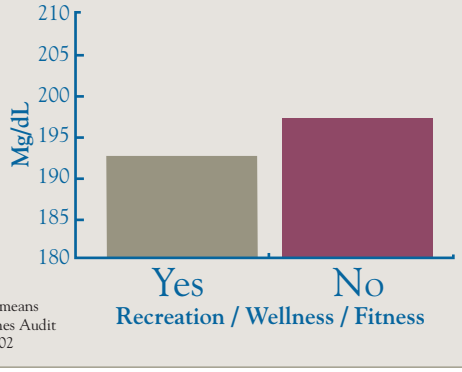



*Adjusted for age, sex • p<0.002 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that implemented diabetes education programs had significantly lower mean total cholesterol levels than patients in programs that did not (mean total cholesterol levels of 193 mg/dl vs. 200 mg/dl, respectively).



## Having Facilities & Mean Cholesterol Levels*




*Adjusted for age, sex • p<0.0001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that established recreation, wellness, or fitness facilities had significantly lower mean total cholesterol levels than patients in programs that did not (mean total cholesterol levels of 193 mg/dl vs. 197 mg/dl, respectively).

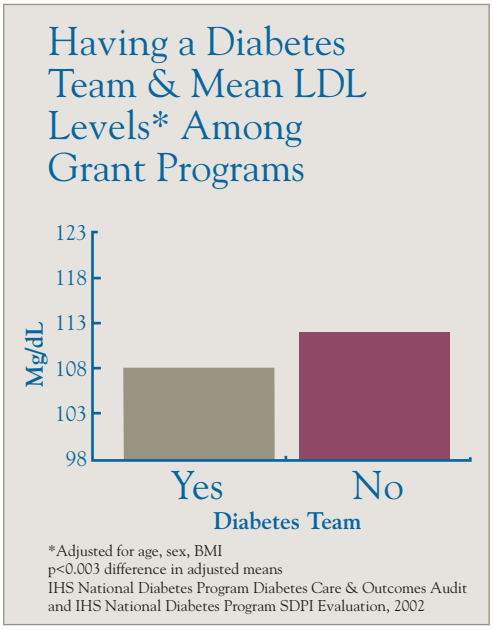
*Certain diabetes program elements implemented with Special Diabetes Program for Indians were associated with* ***better LDL cholesterol level control.***

## *Why is this important:*

Diabetes grant programs chose to implement different elements of diabetes care. These elements are believed to result ultimately in improved outcomes, such as LDL cholesterol control.

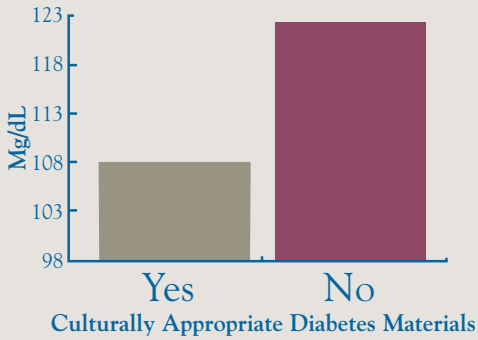
As shown in this series of slides, our analysis found significantly lower mean LDL cholesterol levels for patients who received care in programs with at least one of these program elements:

- Diabetes teams
- Culturally appropriate diabetes education materials
- Organized diabetes education programs
- Recreation, wellness, and fitness facilities




Patients in diabetes grant programs that established a diabetes team had significantly lower mean LDL cholesterol levels than patients in programs that did not (mean LDL cholesterol levels of 108 mg/dl vs. 112 mg/dl, respectively).

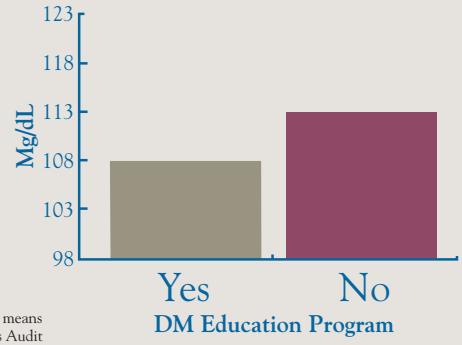
## Having Culturally Appropriate Diabetes Education Materials & Mean LDL Levels* Among Grant Programs




*Adjusted for age, sex, BMI
p<0.001 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that provided culturally appropriate diabetes materials had significantly lower mean LDL cholesterol levels than patients in programs that did not (mean LDL cholesterol levels of 108 mg/dl vs. 122 mg/dl, respectively).

## Having Organized Diabetes Education Programs & Mean LDL Levels* Among Grant Programs

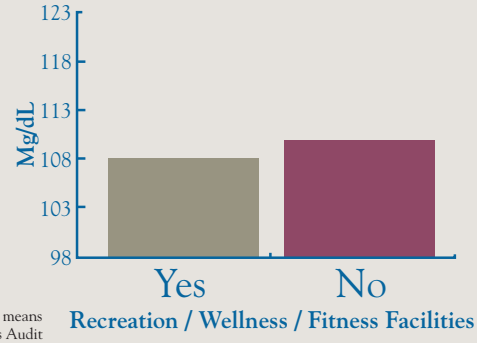



*Adjusted for age, sex, BMI • p<0.03 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that provided organized diabetes education programs had significantly lower mean LDL cholesterol levels than patients in programs that did not (mean LDL cholesterol levels of 108 mg/dl vs. 113 mg/dl, respectively).



## Having Recreation/Wellness/ Fitness Facilities & Mean LDL Levels* Among Grant Programs




*Adjusted for age, sex, BMI • p<0.08 difference in adjusted means
IHS National Diabetes Program Diabetes Care & Outcomes Audit and IHS National Diabetes Program SDPI Evaluation, 2002

Patients in diabetes grant programs that established recreation, wellness, and fitness facilities had lower mean LDL cholesterol levels than patients in programs that did not (mean LDL cholesterol levels of 108 mg/dl vs. 110 mg/dl, respectively), though the difference was not statistically significant.

*Providing **individualized medical nutrition therapy services** to patients with diabetes improves A1C levels.*

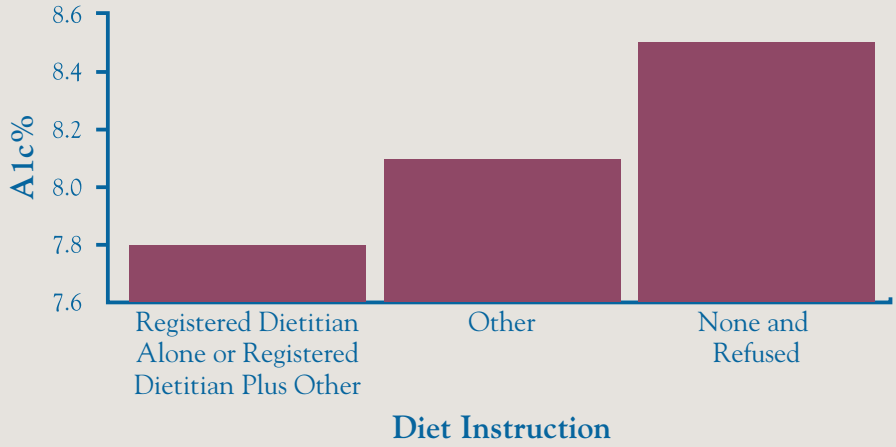
## *Why is this important?*

The Institute of Medicine's (IOM) 1999 report, titled *The Role of Nutrition in Maintaining Health in the Nation's Elderly*, concluded that there is "consistent evidence from limited data to indicate that Medical Nutrition Therapy (MNT) is effective as part of a comprehensive approach to the management and treatment of the following conditions: dyslipidemia, hypertension, heart failure, diabetes, and kidney disease."

Consistent with the American Diabetes Association's recommendations, the IOM recommended that individualized MNT be provided by a Registered Dietitian as part of the multidisciplinary approach to the management of diabetes, which includes diet, exercise, medications and blood glucose monitoring.[51]


Nutrition education helped many reduce their A1C levels.

## Diet Instruction on Mean A1C Levels* Among Grant Programs




*Adjusted for age, sex, duration of diabetes, treatment type • p<0.0001 difference in adjusted means
Source

Patients who had dietary instruction by a Registered Dietitian or a Registered Dietitian plus other medical provider had statistically significant lower mean adjusted A1C levels as compared to patients who received diet instruction from other medical providers (no dietitian instruction), did not receive diet instruction, or refused diet instruction.