



# Diabetes in Indian Country

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# This Presentation

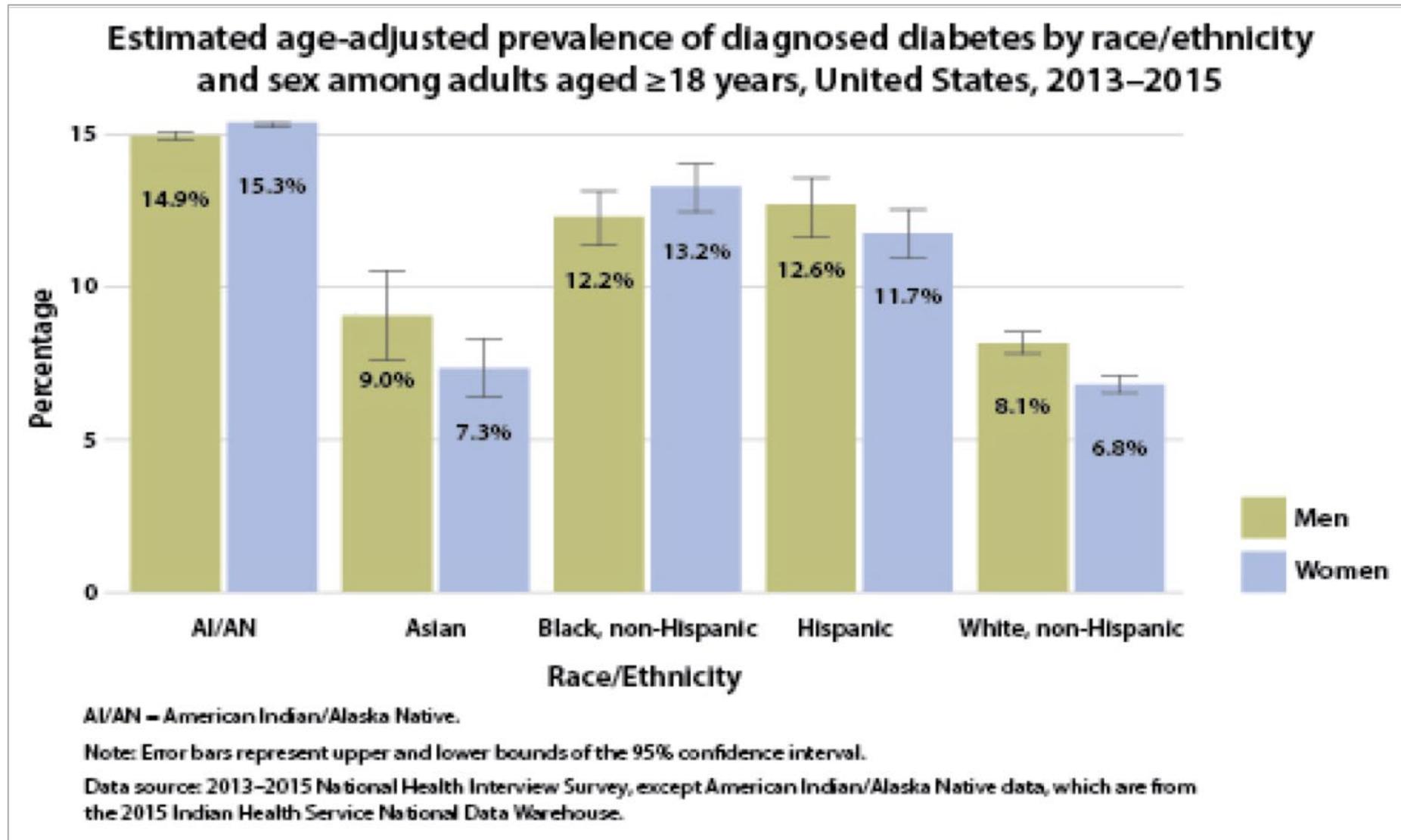
- State of diabetes in American Indian/Alaska Native (AI/AN) people
- Where do we go from here?
  - Science and culture inform the future.



# Diabetes in AI/AN People



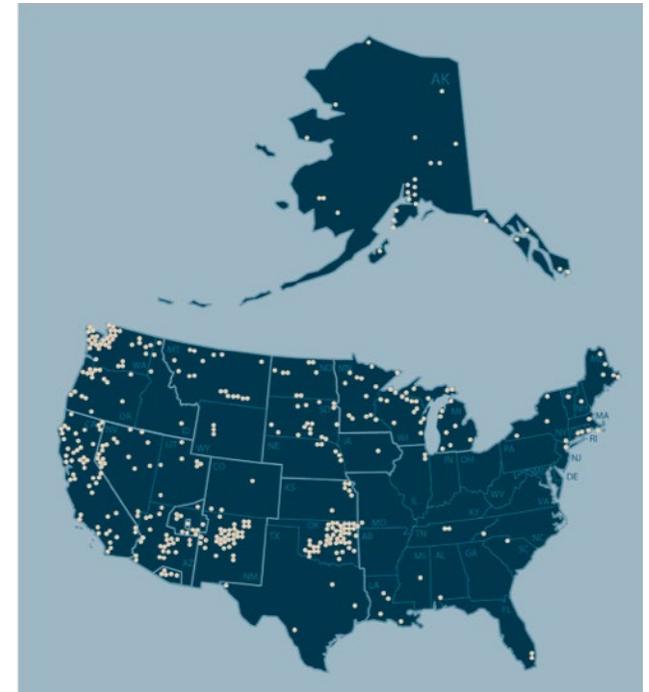
# CDC National Diabetes Statistics Report, 2017





# Special Diabetes Program for Indians (SDPI)

- In the 1990s, prevalence of diabetes and its complications in AI/AN people were rising
- Congress acted by establishing SDPI
- FY 1998–FY 2019
- Today: Grants for 301 Tribal, Indian Health Service (IHS), and Urban Indian programs in 35 states





# Division of Diabetes Resources

- Diabetes Care and Outcomes Audit
  - Annual assessment of over 40 diabetes care process and outcomes measures in over 123,000 AI/ANs with diabetes
- Diabetes Clinical, Educator, and Patient Resources
  - Clinical Tools (e.g., algorithms, Standards of Care)
  - Comprehensive Diabetes Training: webinars, online, conferences
  - Patient education materials, lesson outlines
  - Online Catalog of patient education materials
- Websites:
  - <https://www.ihs.gov/diabetes/>
  - <https://www.ihs.gov/sdpi/>

# My Native Plate

- Use your plate as a guide to help you eat in a healthy way
  - Fill up half of your plate with vegetables.
  - Fill the other half with a grain/starch and a protein.
  - Add a side of fruit.

**MY NATIVE PLATE**

**Fruit**

**Water**

**Grain/ Starch**

**Vegetables**

**Protein**

**Use your plate as a guide to help you eat in a healthy way!**

1. Fill half of your plate with vegetables.
2. Fill the other half of your plate with a grain/starch and a protein.
3. Add a side of fruit.

**Pictured here:**

- Mixed berries
- Cooked spinach
- Baked squash with peppers and herbs
- Steamed wild rice
- Baked deer meat with sage
- Water

Take a picture with your cell phone. Look at the picture later as a reminder!

Produced by:  
Indian Health Service, Division of Diabetes Treatment and Prevention, 04/2018

**Remember:**

- Stay active
- Drink water
- Use a 9-inch plate

**Notes:**

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# Keeping Your Teeth and Gums Healthy When You Have Diabetes

## Keeping Your Teeth and Gums Healthy When You Have Diabetes



People with diabetes have a higher chance of having teeth and gum problems. This is why it is important to manage your blood sugar and take care of your teeth and gums.

**Ways to take care of your teeth and gums:**

-  **Brush your teeth twice a day.**
-  **Floss your teeth each day.**
-  **Get a dental exam at least once a year.**
-  **Avoid foods and drinks that are high in sugar.**
-  **Do not use commercial tobacco, including smokeless and chewing tobacco.**



**Let your health care team know if you have any of these problems:**

- Red or swollen gums
- Pain when chewing
- Loose and shifting teeth
- Bad breath that does not go away
- Sore or bleeding gums when brushing or flossing




Produced by the IHS Division of Diabetes Treatment and Prevention  
For more diabetes information and materials, visit [www.ihs.gov/diabetes](http://www.ihs.gov/diabetes)  
08/2018

Take a picture with your cell phone.  
Look at the picture later as a reminder!





# Glucose Management Algorithm

## Glucose Management in Type 2 Diabetes

**Please Note:** This algorithm is **not** intended for treatment and target selection in children or in women who are or could become pregnant.

**Step 1: Determine Individualized A1C Target Range**  
Select based on age, duration of diabetes, patient preference, comorbidities, hypoglycemia risk, and other factors.

Major Comorbidity	Microvascular Complications		
	Absent or Mild	Moderate	Advanced
Absent (and/or >10-15 years of life expectancy)	6.0-7.0%	7.0-8.0%	7.5-8.5%
Present (and/or 5-10 years of life expectancy)	7.0-8.0%	7.5-8.5%	7.5-8.5%
Marked (and/or <5 years of life expectancy)	8.0-9.0%	8.0-9.0%	8.0-9.0%

**Major comorbidity** includes but is not limited to significant CVD; recent stroke; life-threatening malignancy; or severe CKD, COPD, or chronic liver disease.  
**Microvascular disease:** retinopathy, neuropathy, or CKD.

Adapted from the [VA/DoD Management of Diabetes Mellitus Guideline](#)

↓ If A1C not within individualized target range

**Step 2: Initiate Medication Therapy**  
If significant weight loss or ketonuria, use insulin (hospitalize if acidotic).  
Otherwise:  
**Start metformin** if A1C above patient's target but <9%.  
**Start metformin and** a second medication if A1C ≥9% (see Step 3).

↓ If A1C not within individualized target range

**Step 3: Increase Dosage(s) and/or Add Another Medication**  
Select additional medication(s) based on formulary options, side effects, cost, comorbidities (e.g., CVD), medication regimen complexity, and patient preference.

Medication	Weight	A1C	Risk of Hypoglycemia	Cost
Metformin	- to ↓	↓↓	-	\$
DPP-4 Inhibitor	-	↓	-	\$\$
GLP-1 Receptor Agonist	↓↓	↓↓	-	\$\$\$
Insulin	↑↑ to ↑↑↑	↓↓↓	↑↑↑	\$\$ to \$\$\$
SGLT2 Inhibitor	↓	↓	-	\$\$\$
Sulfonylurea	↑↑	↓↓	↑↑	\$
Thiazolidinedione	↑	↓↓	-	\$

Do not use GLP-1 Receptor Agonists and DPP-4 inhibitors together as no A1C benefit

## Glucose Management in Type 2 Diabetes

### Metformin

Monitor and supplement vitamin B12 as needed with long term use.  
Discontinue if eGFR <30mL/min/1.73m<sup>2</sup>.  
Warning: May cause lactic acidosis (rare).  
Start 500mg daily with meals and increase no faster than 500mg/day each week.  
If GI symptoms occur, may increase more slowly.  
Max dose: Regular release tablets: 2,550mg divided BID or TID.  
XR tablets: 2,000mg daily or divided BID.

### Dipeptidyl Peptidase-4 (DPP-4) Inhibitors\*

**Alogliptin (Nesina®)** Start 25mg daily. May increase risk of heart failure.  
**Sitagliptin (Januvia®)** Start 100mg daily.  
**Linagliptin (Tradjenta®)** Start 5mg daily.  
**Saxagliptin (Onglyza®)** Start 2.5-5mg daily. May increase risk of heart failure.

### Glucagon-Like Peptide-1 (GLP-1) Receptor Agonists

GI side effects common.  
Warning: May increase risk of thyroid tumor.  
**Dulaglutide (Trulicity®)** Start 0.75mg SC weekly. May increase to 1.5mg/week.  
**Exenatide ER (Bydureon®)** Start 2mg SC weekly.\*  
**Liraglutide (Victoza®)** Start 0.6mg SC daily.  
Increase to 1.2mg daily in 1 week. May increase to 1.8mg daily.  
**Indicated to reduce the risk of CV events in patients with established CVD.**  
**Semaglutide (Ozempic®)** Start 0.25mg SC weekly for 4 weeks, then increase to 0.5mg weekly for 4 weeks. May increase to 1mg weekly.

**Insulin** - See [Insulin Therapy Algorithm](#).

### Sodium-Glucose Co-Transporter 2 (SGLT2) Inhibitors\*

May cause volume depletion, orthostatic hypotension, genital fungal infections, DKA, acute kidney injury, and UTI.  
**Canagliflozin (Invokana®)** Start 100mg daily before first meal. May increase 300mg daily.  
Warning: May increase risk of lower limb amputations.  
**Indicated to reduce the risk of CV events in patients with established CVD.**  
**Empagliflozin (Jardiance®)** Start 10mg daily. May increase to 25mg daily.  
**Indicated to reduce the risk of CV death in patients with established CVD.**

### Sulfonylureas

May cause hypoglycemia, weight gain.  
**Glipizide** Start 2.5-5mg daily - max 20mg BID. ER formulation dosed 5-20mg daily.  
**Glimepiride** Start 1-2mg daily - max 8mg daily.

### Thiazolidinedione (TZD)

May increase risk of bone fracture. Do not use in patients with bladder cancer.  
Check LFTs before starting. May cause weight gain.  
Warning: Increased risk of heart failure.

**Pioglitazone (Actos®)** Start 15mg daily; may increase to 30-45mg daily.  
Max A1C changes may take up to 12 weeks to occur.

\* See prescribing reference when eGFR <60ml/min/1.73m<sup>2</sup>.

Medications on the IHS National Core Formulary are in **BOLD** above.

Please consult a complete prescribing reference for more detailed information. This is a summary of the most commonly ordered non-insulin diabetes medications and drug classes from the IHS National Supply Service Center. No endorsement of specific products is implied.



# Percent of SDPI Programs Reporting Diabetes Services

<b>Intervention</b>	<b>1997</b>	<b>2013</b>
Diabetes clinical teams	30%	96%
Diabetes patient registries	34%	98%
Nutrition services for adults	39%	93%
Access to registered dietitians	37%	79%
Access to physical activity specialists	8%	74%
Access to culturally tailored diabetes education materials	36%	97%
Adult weight management programs	19%	78%
Nutrition services for children and youth	65%	84%
Community-based physical activity programs for children and youth	13%	80%
Physical activity programs for school-age youth	9%	80%

Source: Evaluation of the SDPI Community-Directed Diabetes Programs



# Is It Working?



# Improving Trends in AI/AN People

- **Diabetes prevalence**

- Adults: the years of increasing diabetes prevalence stopped in 2011
- Youth: the rise in diabetes prevalence stopped at least as early as 2006
  - IHS National Data Warehouse

- **Childhood obesity**

- Prevalence of obesity in AI/AN youth aged 2–19 years was nearly constant from 2006–2015
  - Am J Public Health 2017; 107: 1502–1507



# Uncontrolled Diabetes

- AHRQ Data Spotlight:
  - “Hospital Admissions for Uncontrolled Diabetes Improving Among American Indians and Alaska Natives”
    - Decreased 84% from 2000 to 2015

Agency for Healthcare Research and Quality (AHRQ)

AHRQ Publication No. 18(19)-0033-7-EF, December 2018



# Diabetic Retinopathy

- IHS Joslin Vision Network Teleophthalmology Program (JVN)
  - Telemedicine program to look for diabetic eye disease
  - Established in 2000
- Retrospective data analysis of 54,000 AI/AN people with diabetes who participated in the JVN program 2011-2016
- Compared with studies done in the 1980s and 1990s, the *prevalence of diabetic retinopathy and macular edema decreased by over 50%*.
  - PLoS ONE 2018; 13 (6): e0198551

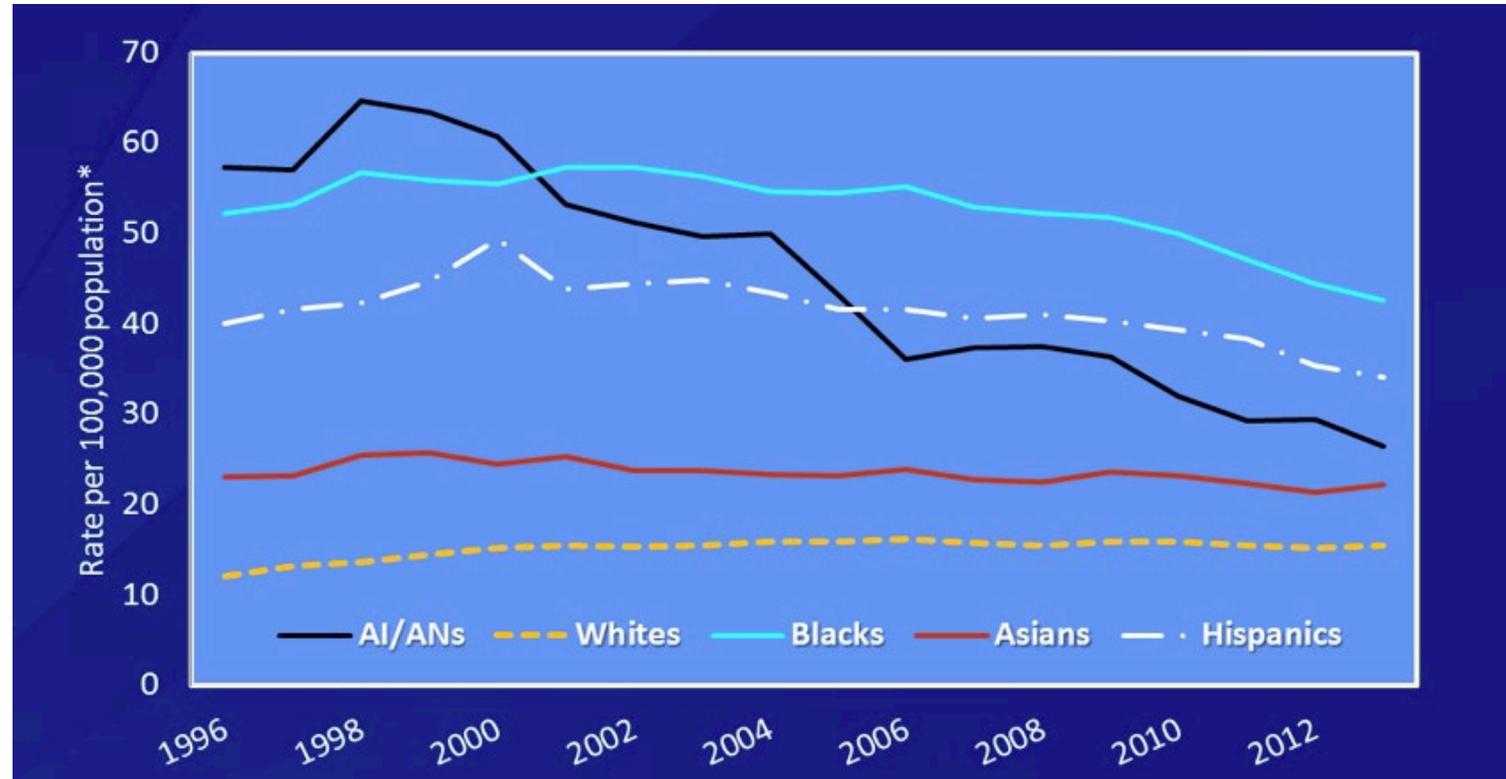


# Diabetes-Related Kidney Failure

- CDC Vital Signs
  - **“Native Americans with Diabetes: Better diabetes care can reduce kidney failure”**
    - MMWR, January 10, 2017
- Used data from the U.S. Renal Data System, U.S. Census, and IHS Diabetes Audit



# Kidney Failure from Diabetes among AI/AN Adults Decreased by 54% (1996–2013)



\*Rate per 100,000 population and age-adjusted based on the 2000 U.S. standard population.

AI/AN = American Indians and Alaska Natives. Racial groups include persons of Hispanic and non-Hispanic origin; Hispanics may be of any race.

Source: Data from the U.S. Renal Data System and the U.S. Census.



# SDPI Cost Savings

- HHS ASPE released an Issue Brief on May 10, 2019 titled “The Special Diabetes Program for Indians: Estimates of Medicare Savings”
- ASPE estimated that the decrease in new cases of kidney failure due to diabetes in AI/AN people resulted in 2,200 to 2,600 fewer cases and \$436 to \$520 million of savings to Medicare over a ten-year period— with some part of that attributable to SDPI.

Office of the Assistant Secretary for Planning and Evaluation (ASPE)

Department of Health and Human Services (HHS)

ASPE Issue Brief, May 10, 2019

<https://aspe.hhs.gov/pdf-report/special-diabetes-program-indians-estimates-medicare-savings>



# How Many of Us...

- Have been with SDPI and/or worked in the Indian health system for:
  - 20+ years
  - 15–19 years
  - 10–14 years
  - 5–9 years
  - Less than 5 years
- You all help make these remarkable improvements happen!



# Where Do We Go From Here?



# Larger Context of Diabetes

- In 1997, diabetes was thought to be caused by genetics and lifestyle choices
- We now know that model needs to be expanded!
- It does matter what genes we inherit
  - But the proportion of predisposition explained for type 2 DM (5%–10%) is fairly small
    - NEJM 2010; 363: 2339-50
  - And genes which are associated with increased diabetes risk are as common in non-minority as in minority people
    - Diabetes Care 2012; 35: 193–195
- It turns out that the roots of diabetes are very similar to those for other significant problems in our communities
  - Including heart disease, depression, school problems, substance abuse, domestic violence



# Stress and Diabetes Risk

- Study in 18,000 adults: dose-response association between the number of risk factors and onset of diabetes over the next 3.5 years:
  - < High school education
  - Financial worry
  - Being single or separated
  - High stress
  - Intimate partner violence
  - Concentrated neighborhood poverty
  - Depressive symptoms
  - Smoking
    - JAMA Network Open 2019;2(5):e193933



# Food Insecurity

- 42% of households below poverty level are food insecure
  - As are 21% of all households with children
    - NEJM 2010;363:6-9
- Prevalence of food insecurity in AI/AN households is very high
  - 61% in one study in families with young children
    - BMC Public Health 2017;17:611
- Food insecurity more than doubles the risk of developing diabetes
  - PLoS ONE 2018;13(5):e0195962
  - Increased risk for poor blood sugar control
    - Diabetes Care 2012;35:233-238
- Diet quality associated with weight gain even if calories restricted
  - JAMA 2014;311(21):2167-2168



# Developmental and Toxic Stress

“...many adult diseases should be viewed as developmental disorders that begin early in life and

...persistent health disparities associated with poverty, discrimination, or maltreatment could be reduced by the alleviation of toxic stress in childhood.”

American Academy of Pediatrics

“The Lifelong Effects of Early Childhood Adversity and Toxic Stress”

Pediatrics 2012;129:e232-e246



# Trauma

- **Trauma:** anything that ***overwhelms*** our ability to respond, especially if we perceive that our life or our connection to things that support us physically or emotionally is threatened
  - Can cause lasting changes in the brain and body that increase risk for many problems
  - Any later experiences which remind the brain of prior trauma, can trigger same physical and emotional responses as at time of original trauma
- **When trauma occurs during the *development* of brain and body systems, it can have lifelong impact**
  - Toxic stress: when a child experiences *strong, frequent, and/or prolonged adversity*—such as physical or emotional abuse, chronic neglect, caregiver substance abuse or mental illness, exposure to violence, and/or the accumulated burdens of family economic hardship—*without adequate adult support*.
    - Harvard Center on the Developing Child
- **Adverse Childhood Experiences (ACE):** abuse, neglect, and/or household dysfunction experienced in childhood
  - Increase risk at *any* level: graded, dose-response relationship

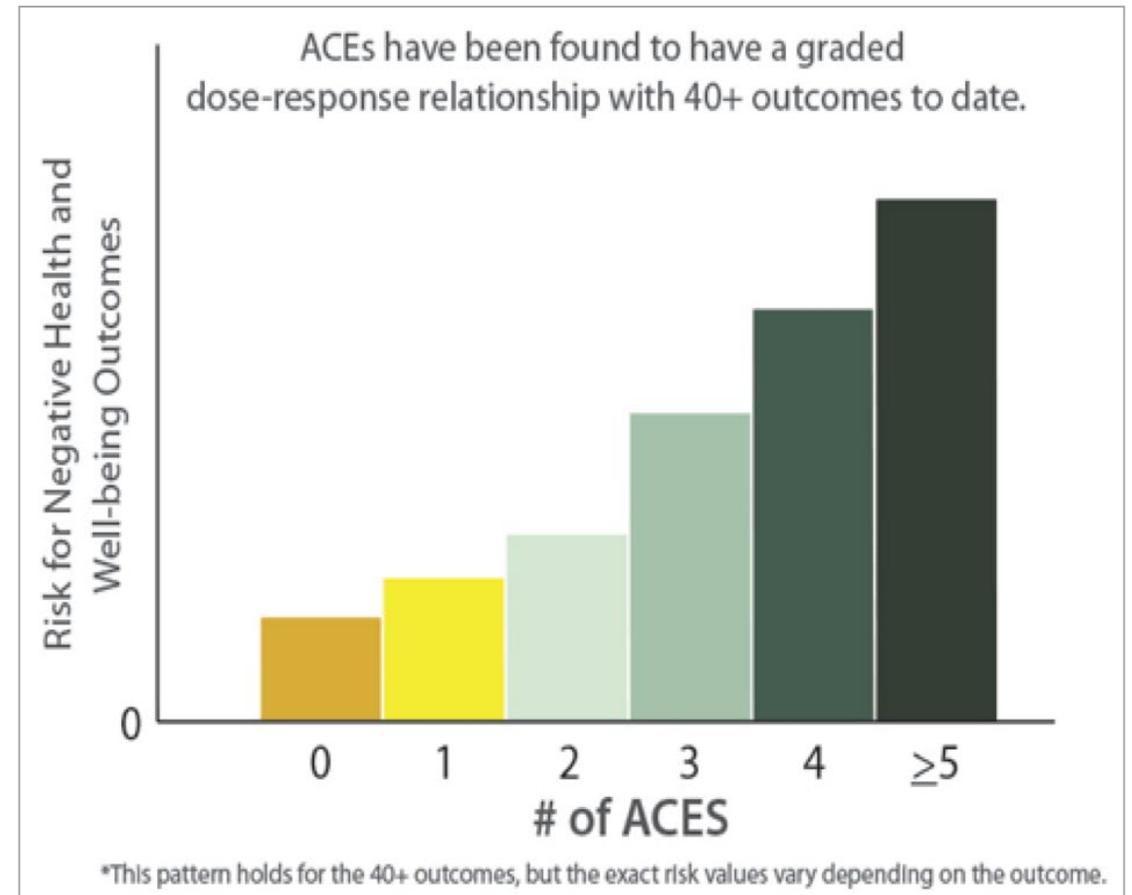


# Adverse Childhood Experiences (ACEs)

- Physical Abuse
  - Emotional Abuse
  - Sexual Abuse
  - Family Substance Abuse
  - Family Mental Illness
  - Incarcerated Family Member
  - Parental Separation/Divorce
  - Seeing Mother Physically Abused
  - Physical Neglect
  - Emotional Neglect
- ACE “score” = number of categories experienced before age 18 years

# ACEs Can Have Lasting Effects On...

- **Health** (obesity, diabetes, depression, suicide attempts, STDs, heart disease, cancer, stroke, COPD, broken bones)
- **Behaviors** (smoking, alcoholism, drug use)
- **Life Potential** (graduation raged, academic achievement, lost time from work)





# ACEs and Diabetes/Heart Disease

- Whitehall Study: Every additional ACE increased likelihood of developing diabetes by 11%
  - Diabetes Care 2018; 41: 2120–2126
- Across 10 countries, adults who experienced three or more childhood adversities:
  - Hazard ratios 1.59 for diabetes, 2.19 for heart disease
    - Risk is similar to the association between cholesterol and heart disease
      - Arch Gen Psych 2011; 68: 838–844
- Behavioral Risk Factor Surveillance System (BRFSS): Over 45,000 participants
  - ACE prevalence was high: 52% reported one or more ACE, 25% reported two or more ACEs
  - Risk for diabetes, hypertension, and dyslipidemia increased in a dose-response relationship to ACEs
  - ACEs increased risk independently of their effect on unhealthy behaviors
    - Am J Med 2019; 132: 605–613



# ACEs in AI/AN Children

- National Survey of Children's Health
  - 1,453 AI/AN children aged 0–17 years compared with 61,381 white children from the 2011–2012 Survey
  - AI/AN children were more likely to have experienced:
    - 2+ ACEs (40.3% vs. 21%)
    - 3+ ACEs (26.8% vs. 11.5%)
    - 4+ ACEs (16.8% vs. 6.2%)
    - 5+ ACEs (9.9% vs. 3.3%)
  - AI/AN kids with 3+ ACEs compared with AI/AN with < 2 ACEs
    - Prevalence of depression, anxiety, ADHD 14.4%, 7.7%, 12.5% vs. 0.4%, 1.8%, 5.5%
    - School problems, grade failures, need for medication and counseling were two to three times higher



# Prenatal Risk Factors

- High levels of racial inequality and socioeconomic inequality increase the risk of SGA birth, particularly when they co-occur.
  - Am J Public Health 2015; 105: 1681–1688
- Maternal stressful life events during first trimester increases risk of preterm birth (OR 2.4)
  - Am J Obstet Gynecol 2010; 203: 34.e1–8
- Being born early and/or small are strongly associated with later risk for diabetes and heart disease
  - Diabetes 2009; 58: 523–526

# Vibrant and Healthy Kids

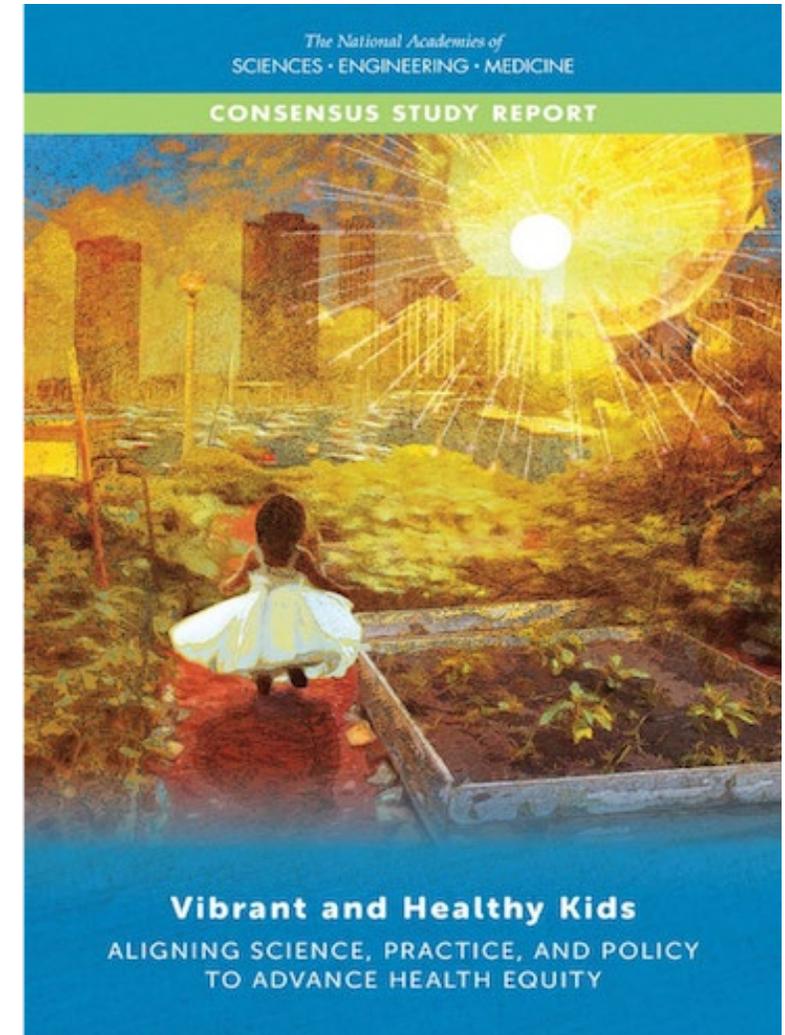
“Early experiences and life circumstances shape prenatal and early childhood development, with powerful impacts on the developing brain and body that shape health outcomes across the life course and can span generations.”

“Vibrant and Healthy Kids: Aligning Science, Practice, and Policy to Advance Health Equity”

Consensus Study Report Highlights

National Academy of Sciences, 2019

<https://youtu.be/hBT8H05MoPk>





# Interventions

- So if pregnancy and early life stress, trauma, and inadequate nutrition increase the risk for obesity and diabetes (and many other problems!), what do we do?
  - Early life Home Visiting (e.g., Family Spirit, Nurse-Family Partnership)
  - Screen for ACEs in children—and intervene early
  - “Enhanced” Case Management—assess and address:
    - Food insecurity
    - Housing, transportation, childcare, education, mental health/substance abuse
  - Traditional foods, culture



## We'll Explore These Larger Issues Over the Next Three Days

- This morning:
  - Life Course (Dr. Halfon)
  - ACEs (Ms. Davidson)
  - Early Life Interventions (Dr. Hirschfeld)
- Tomorrow:
  - Traditional Foods and Food Systems (Ms. LaDuke)
  - Food Sovereignty and Food Insecurity (Dr. BlueBird Jernigan)
  - Stress (Dr. Proulx)
  - Social Determinants of Health (Dr. Schillinger)
- Friday:
  - Culture and Wellness (Dr. Walls and Mr. Collins/Ms. Luger)

# Pima Pride Study

- Pilot study for the DPP clinical trial conducted by the NIH
- Pima Indians who were obese but normoglycemic were randomized to:
  - “Pima Action”: lifestyle intervention group
    - Structured diet/exercise meetings
  - “Pima Pride” control group
    - Unstructured activities emphasizing Pima culture and history
- At the end of the study, the “Pima Pride” group had more positive results on every biological parameter measured
  - Diabet Med 1998;15:66-72



# Key Points

- We're making remarkable progress to turn diabetes around!  
Let's keep at it!
- Many of the roots of diabetes are similar to those for other problems in our communities—this new paradigm demands new approaches
- What would we do if we really “get it” that trauma and poverty are the roots of so many problems?
  - What will we do when we go home?

# We Have Much to Celebrate!

## Thank you

