

Epigenetic Impact of Unresolved Trauma and Poor Nutrition

**3rd Annual Conference on
Native American Nutrition
Prior Lake, MN
October 5, 2018**

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University of North Dakota School of Medicine & Health Sciences



LAKOTA

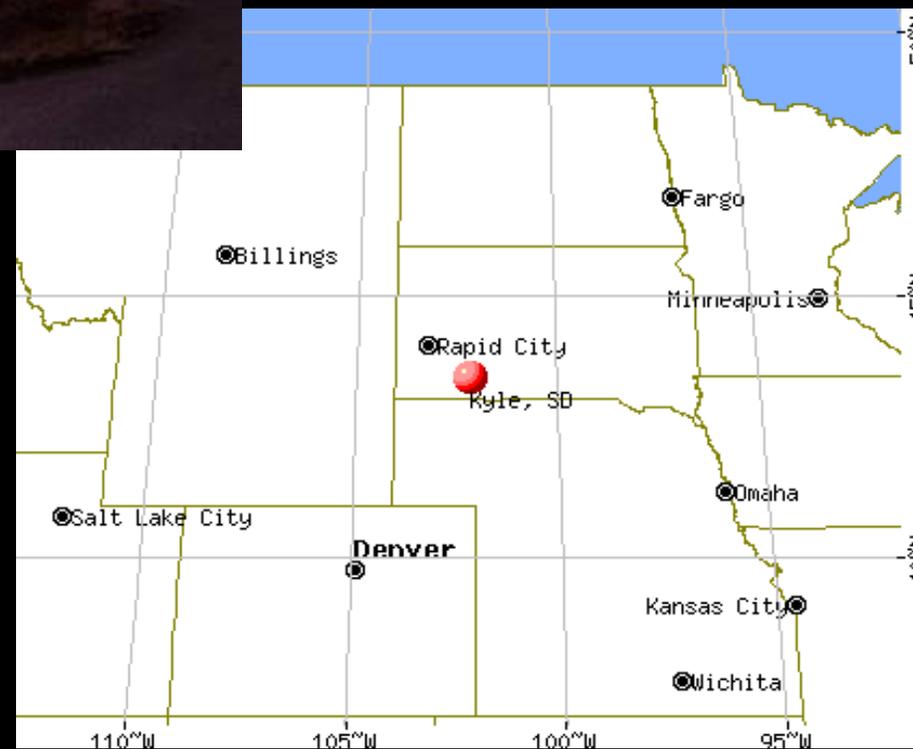
DAKOTA

NAKOTA





Pine Ridge Reservation Kyle, S.D.









Traditional View of Public Health



Social Determinants of Health

Life-enhancing resources, such as food supply, housing, economic and social relationships, transportation, education and health care, *whose distribution across populations* effectively determines length and quality of life.

AI Health Disparities

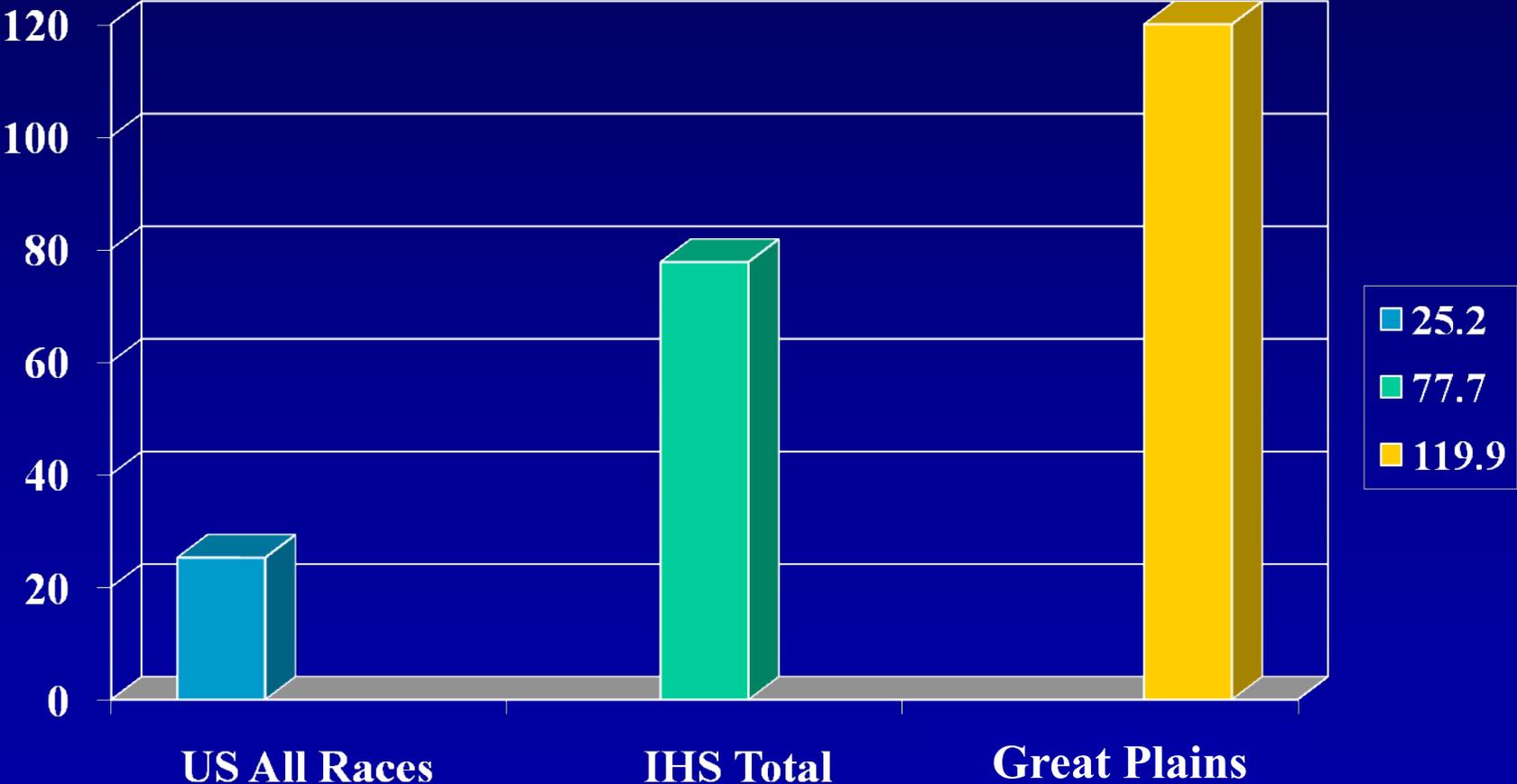
Average age at death in ND (2010 – 2014):

77.4 Years in the White Population

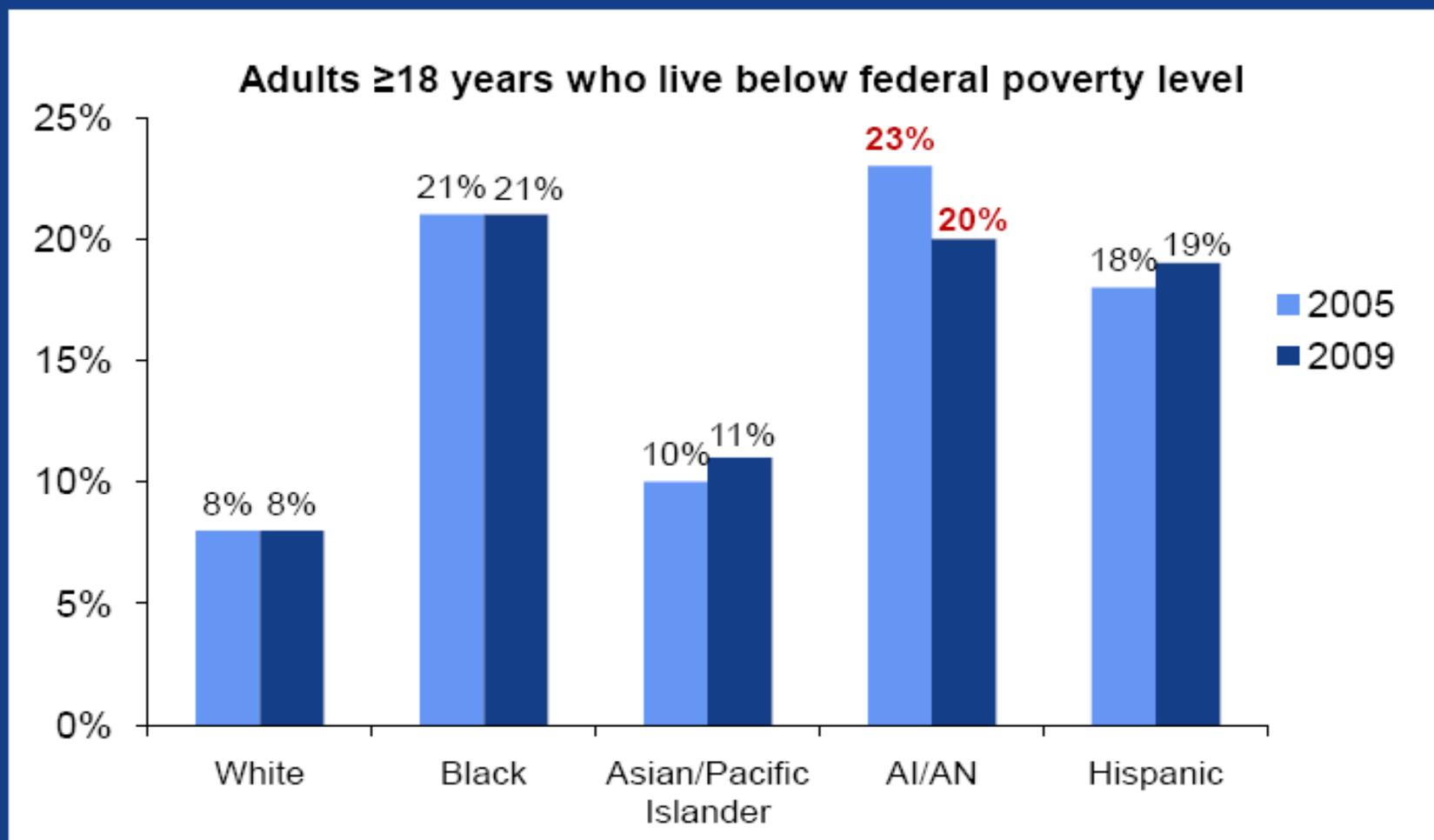
56.6 Years in the AI Population

Diabetes Death Rates

(Rate/Per 100,000 Population)

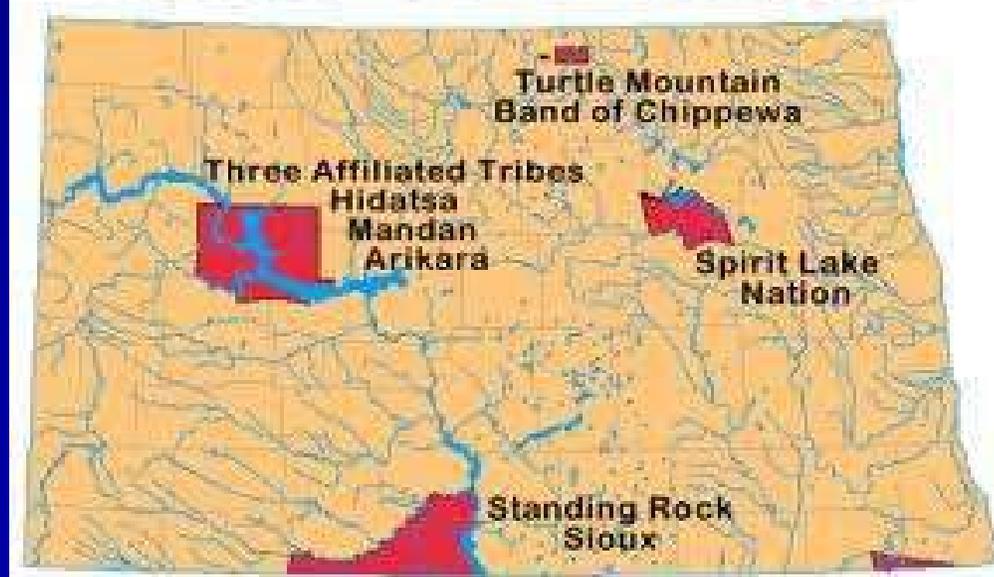
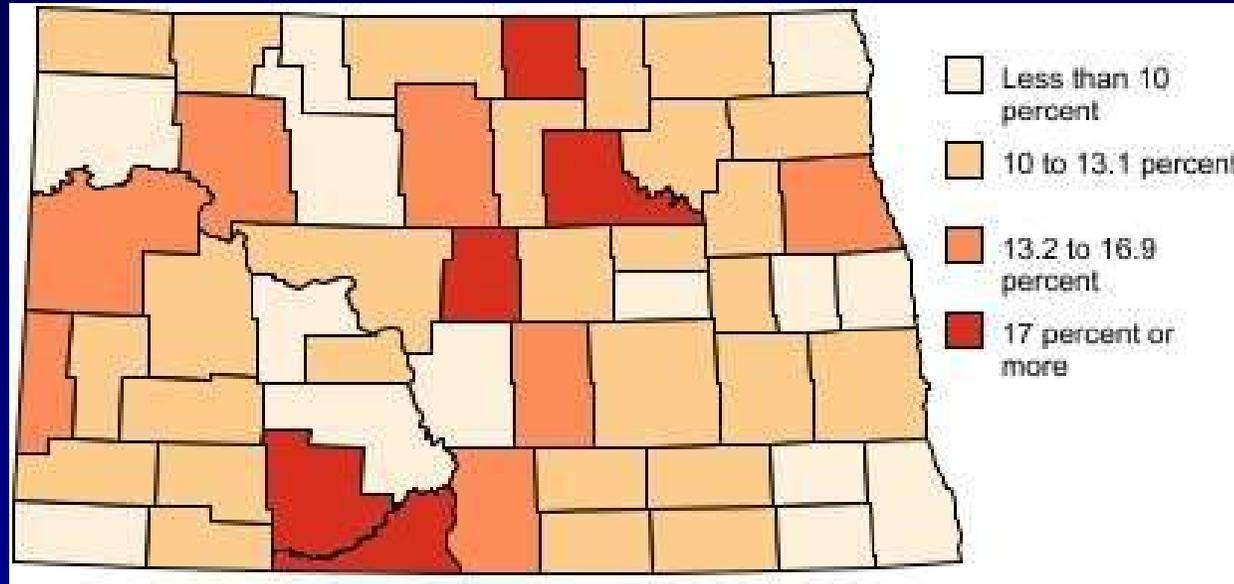


2.5 times as many AI/ANs as whites live below poverty level

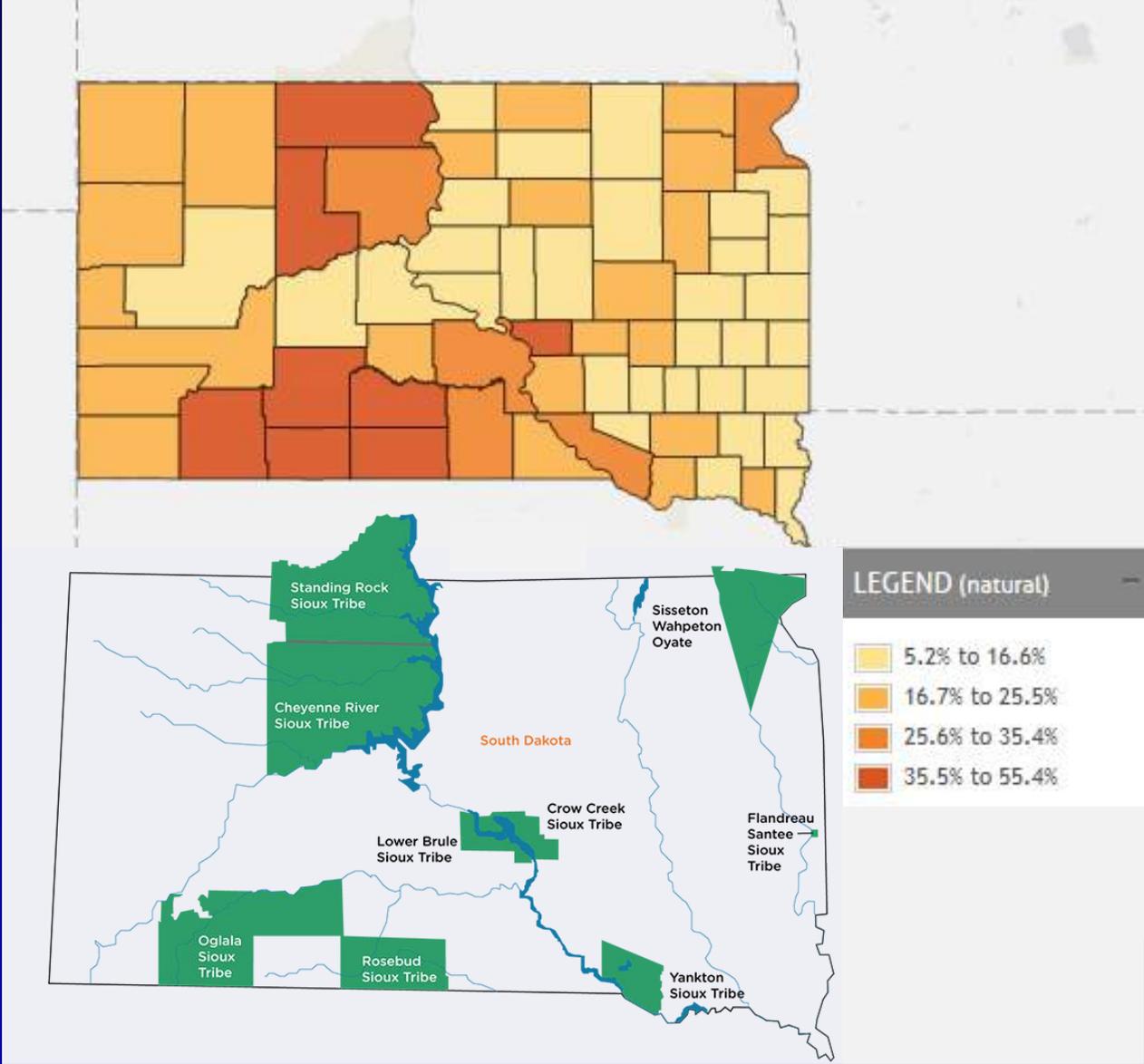


Source: CDC Health Disparities and Inequalities Report 2011, MMWR, Vo. 60

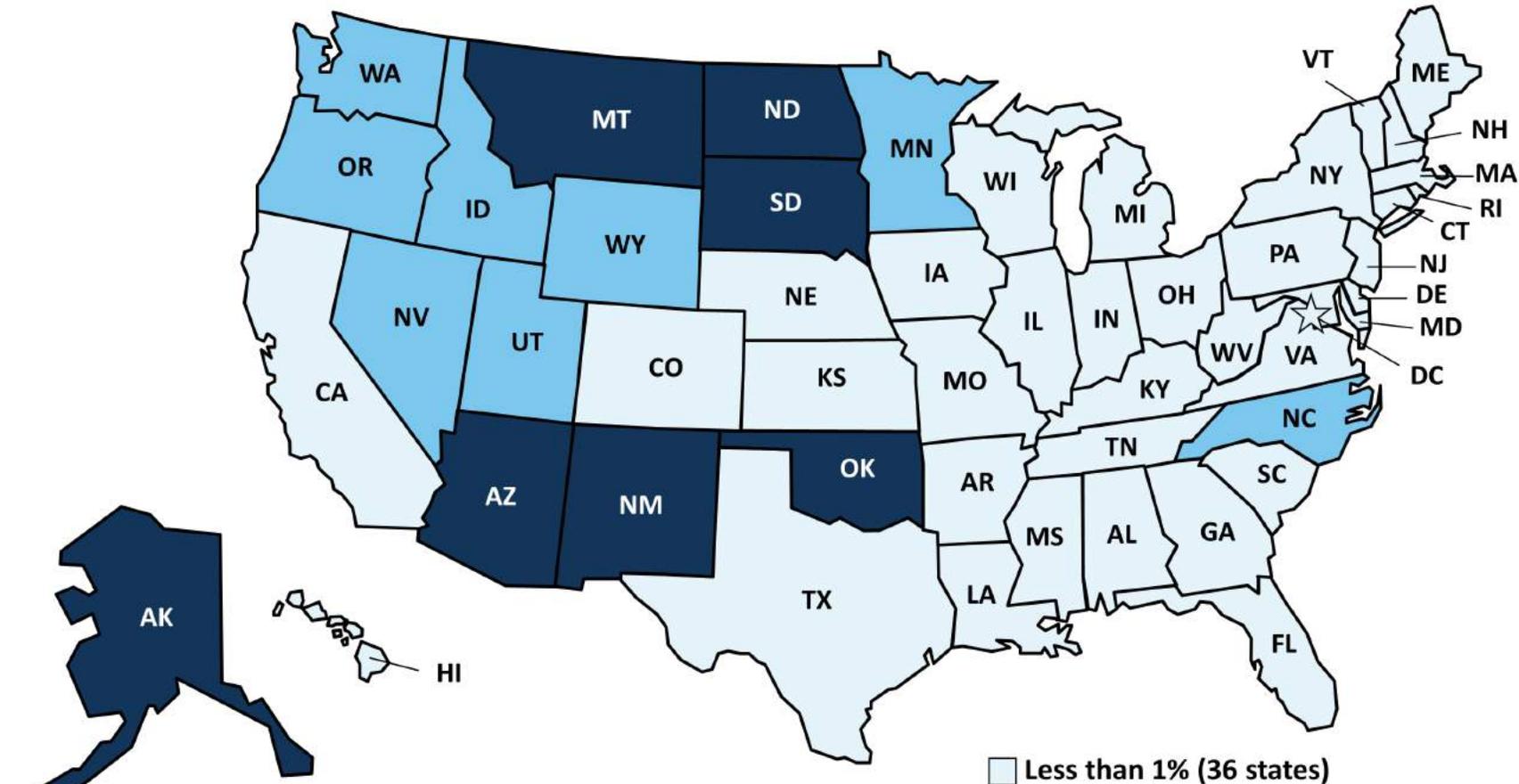
Poverty in North Dakota



Poverty in South Dakota



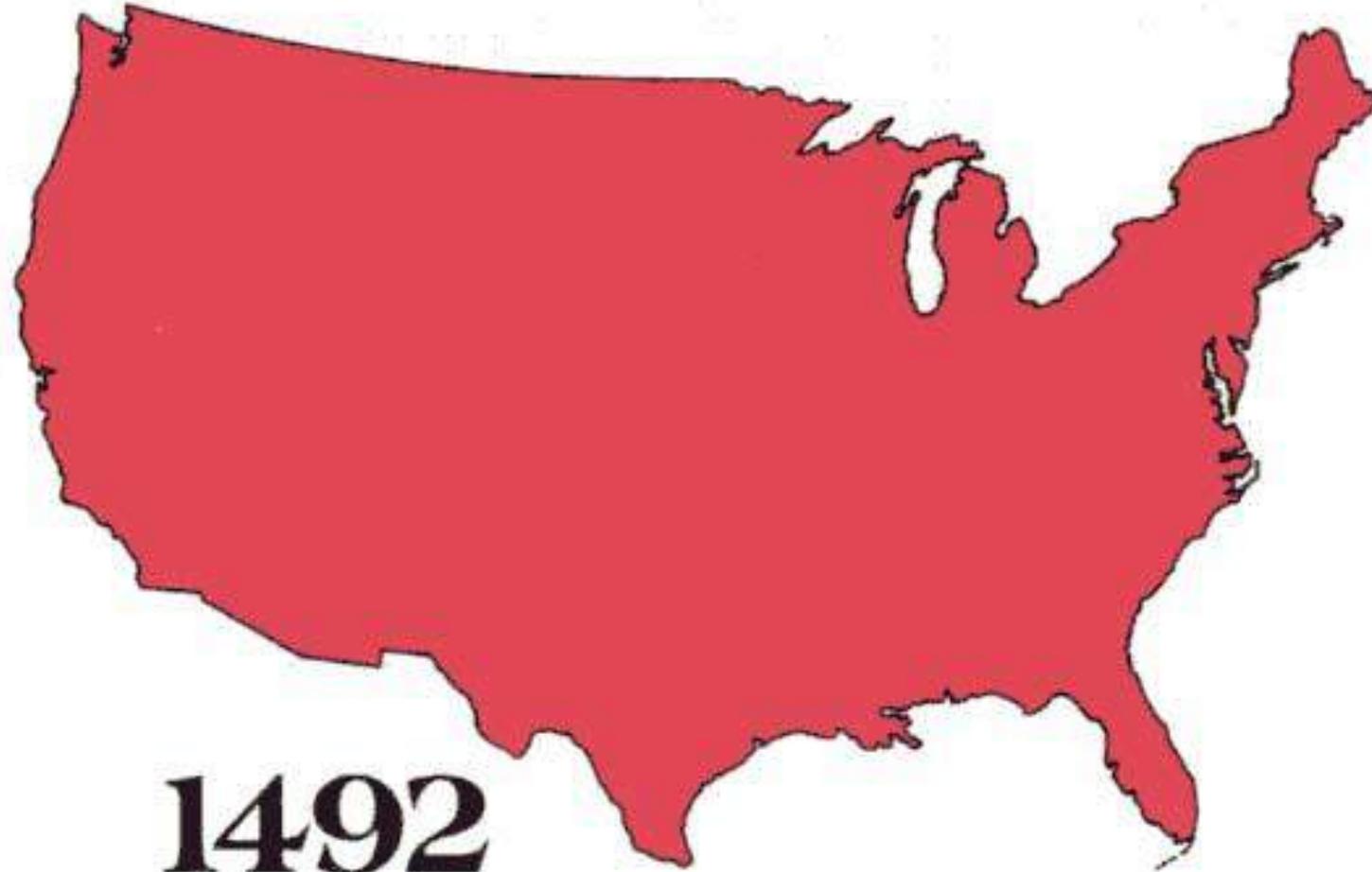
American Indians and Alaska Natives as a Share of the Total Population, by State, 2009-2011



Total: 2.5 million = 1% of U.S. Population

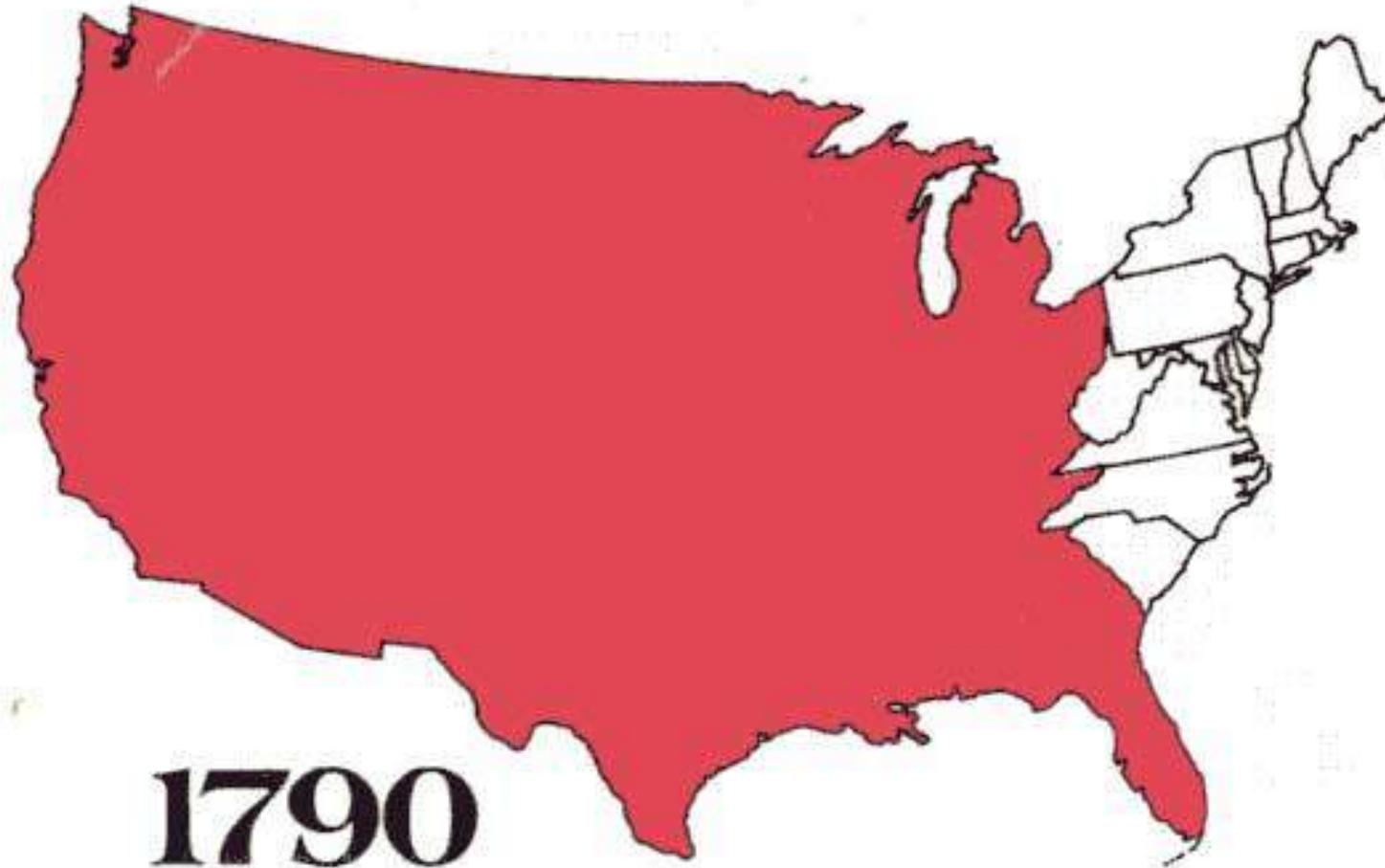
American Indian and Alaska Native includes people of Hispanic origin.
SOURCE: KCMU analysis of 2009 - 2011 ACS.

Historical Context



1492

Historical Context



1790



B.S.

You will do well to try to Inoculate the
Indians by means of Blankets, as well as to try
Every other Method that can serve to extirpate
this execrable Race. I should be very glad your
Scheme for Hunting them Down by Dogs could take
Effect

Effect, but I find it is at too great a Distance
to think of that at present

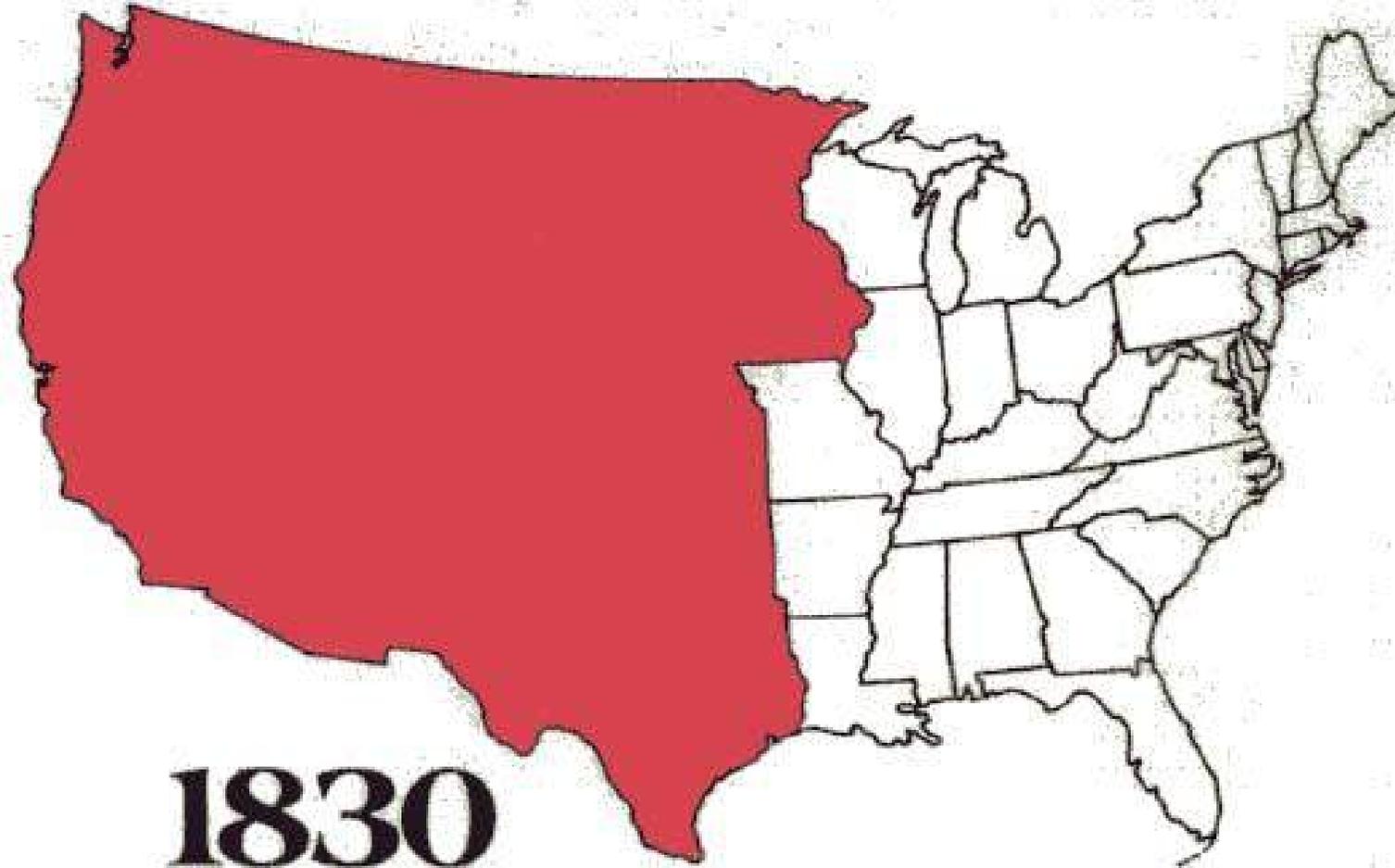
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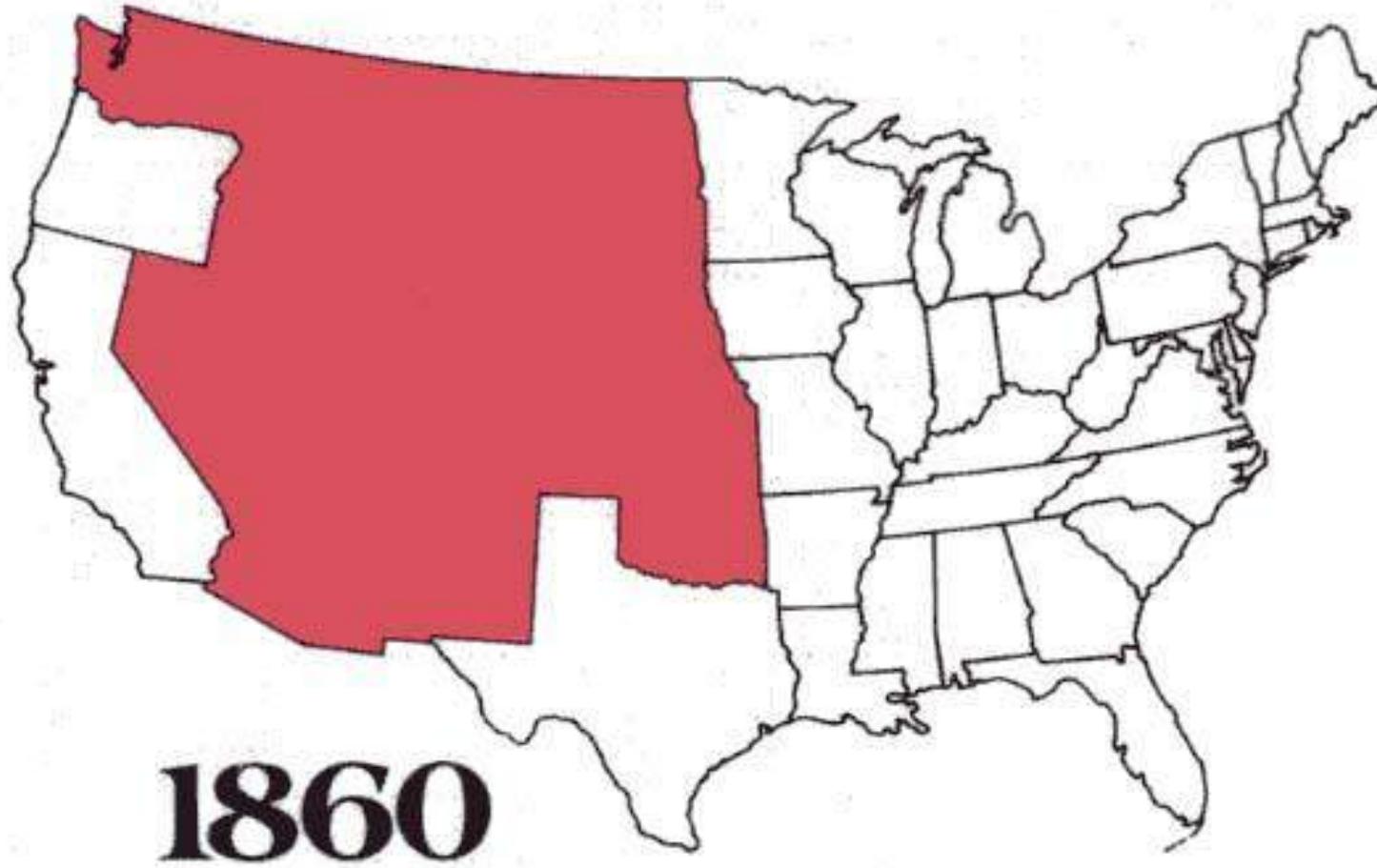
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Historical Context





Historical Context



Dakota War of 1862

VALUE OF AN INDIAN SCALP

Minnesota Paid Its Pioneers a **Bounty** for Every **Redskin** Killed

It is not generally known in latter day Minnesota history that the state treasury once paid out cash as bounties for Sioux Indian scalps, just as this and many other states are now paying for wolf scalps. State Treasurer Koerner yesterday, in looking over the 1863 report of State Treasurer Charles Schaff, discovered the following item among the disbursements of that year:

J. C. Davis, Sioux scalp.....\$25

This item occurs in the list of disbursements, amounting in all to \$7,870.06, under the head "Suppressing Indian War." The \$25 paid to J. C. Davis for

Dakota War of 1862

The Daily Republican Winona, MN—1863

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State Ticket.

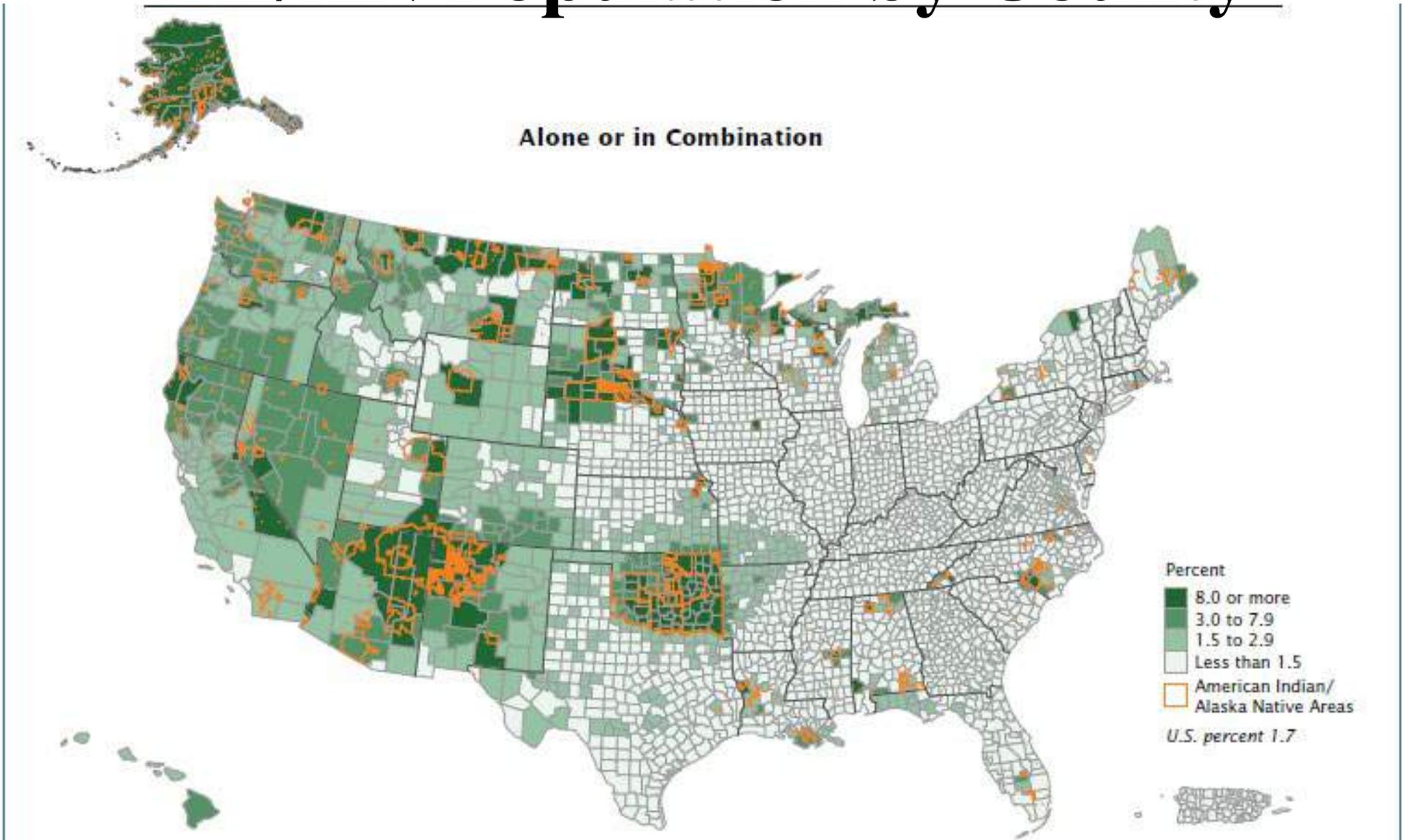
For Governor.....STEPHEN MILLER, of Stearns.
For Lieut. Governor...CHAS. D. SHERWOOD, of Fillmore.
Secretary of State.....DAVID BLACKLY, of Ollisted.
Auditor of State.....WAS. McILRATH, of Nicollet.
State Treasurer.....CHAS. SCHAEFER, of Washington.
Attorney General.....GORDON E. COLE, of Rice.
Clerk Supreme Court...GEO. F. POTTER, of Houston.

County Ticket.

For State Senator.....THOMAS SIMPSON.
For Representatives.....EARLE S. YOUNG,
THOMAS P. DIXON.
For Sheriff.....LYNCH J. KING.
For Treasurer.....MATHEW J. NORBY.
For Surveyor.....N. FELIX HILBERT.
For Coroner.....EDWARD ELY.

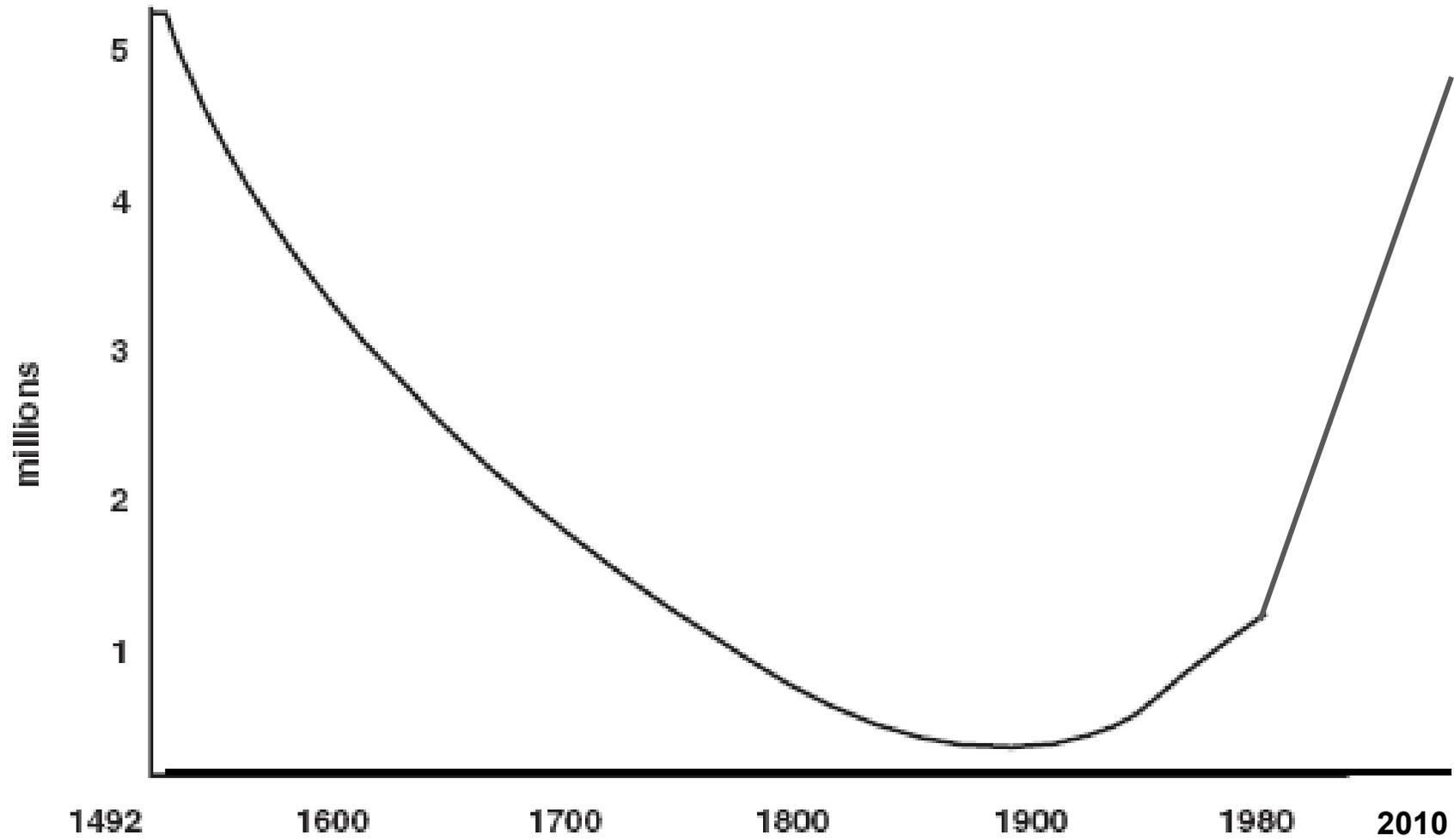
THE State reward for dead Indians has been increased to \$200 for every red-skin sent to Purgatory. This sum is more than the dead bodies of all the Indians east of the Red River are worth.

AI/AN Population by County

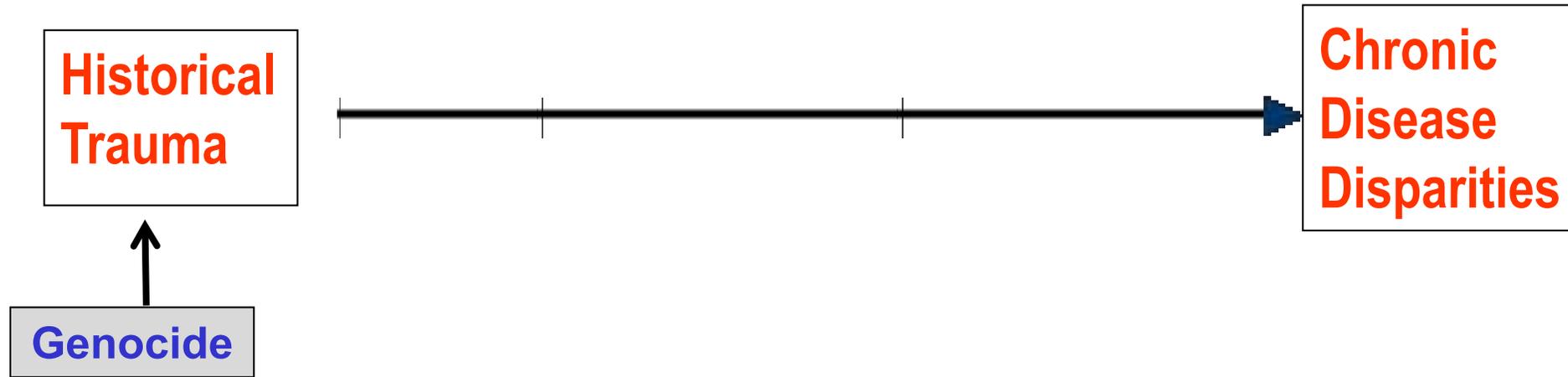


Source: U.S. Census Bureau, 2010 Census Redistricting Data (Public Law 94-171) Summary File, Table P1.

AI/AN Population Decline and Recovery, 1492 – 2010



Inter-Generational Basis for Chronic Disease Disparities Among American Indians and Alaska Natives



Historical trauma

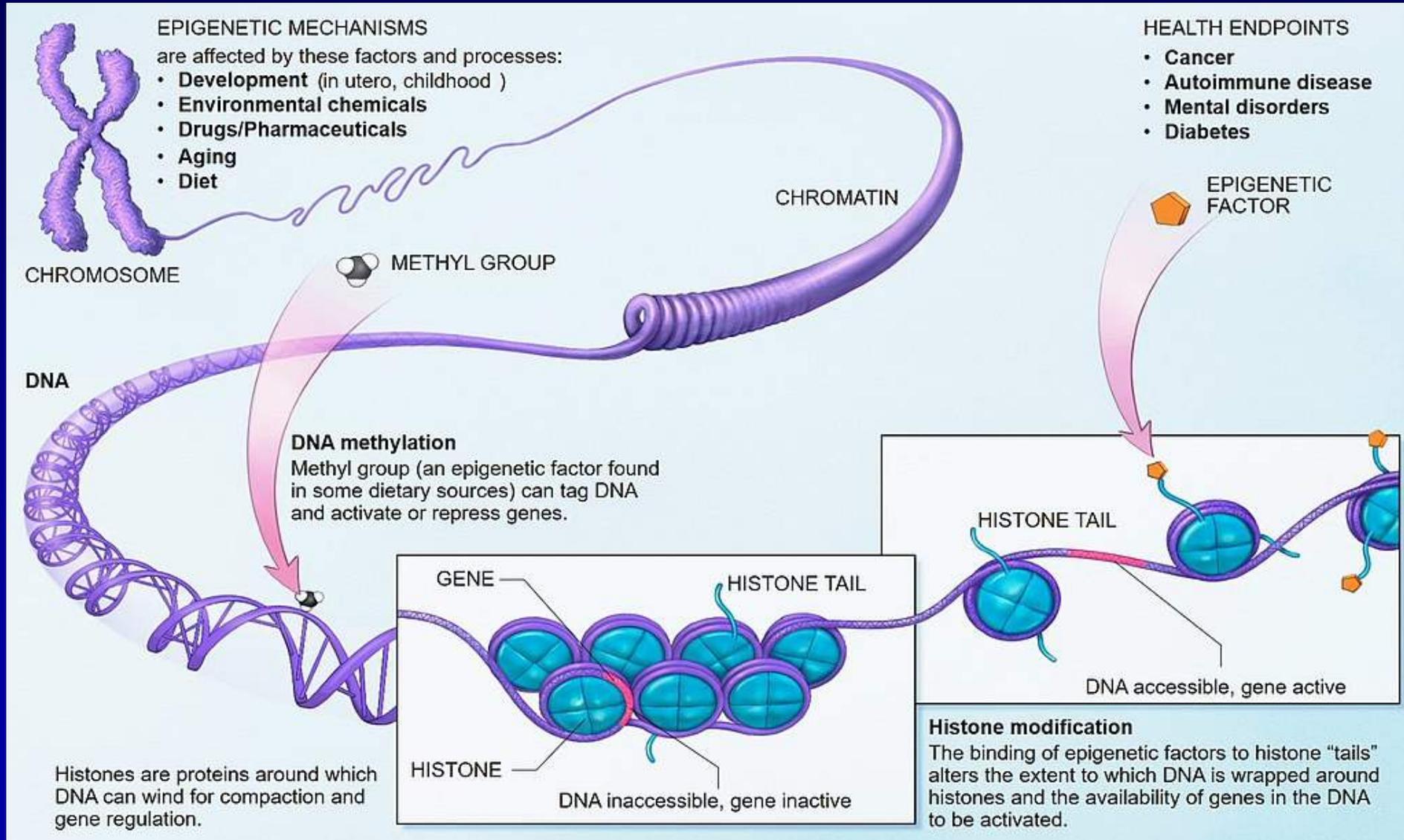
- Collective emotional wounding across generations that results from massive cataclysmic events – Historically Traumatic Events (HTE)*
- Trauma is held personally and transmitted over generations. Family members who have not directly experienced the trauma can feel the effects generations later

Epigenetics

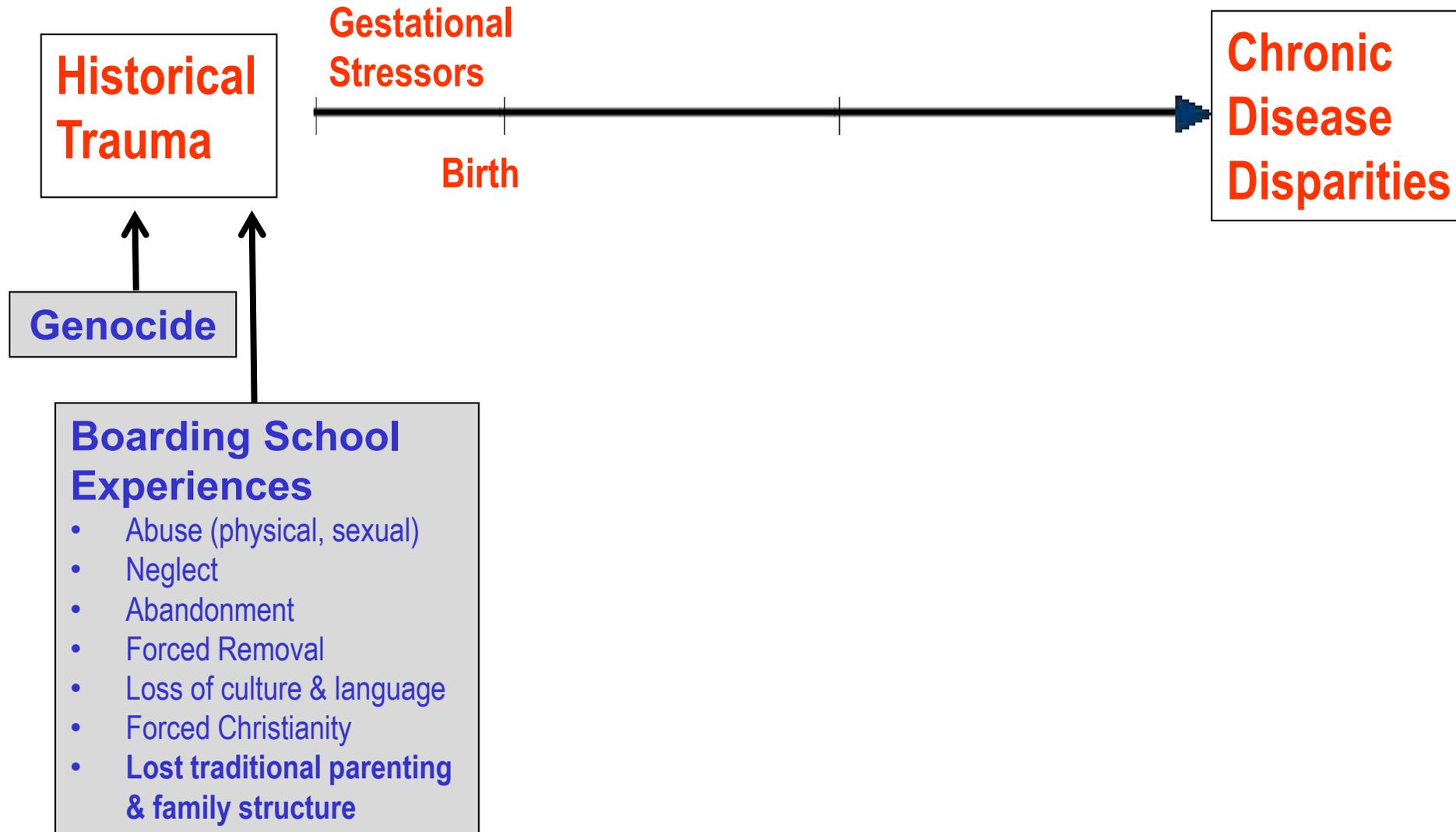
- The study of changes in the regulation of gene activity and expression that are not dependent on DNA sequence.
- Methylation
- Histones
- Telomeres



Epigenetics



Inter-Generational Basis for Chronic Disease Disparities Among American Indians and Alaska Natives





ALFRED
WICKS
DECEASED 1911

SAMUEL
CHERT
DECEASED
1911

MAE
HELEN
ADAM
DECEASED
1911

SARA
SMITH
DECEASED
1911

ROBERT
SCOTT
FRANCIS
DECEASED
1911



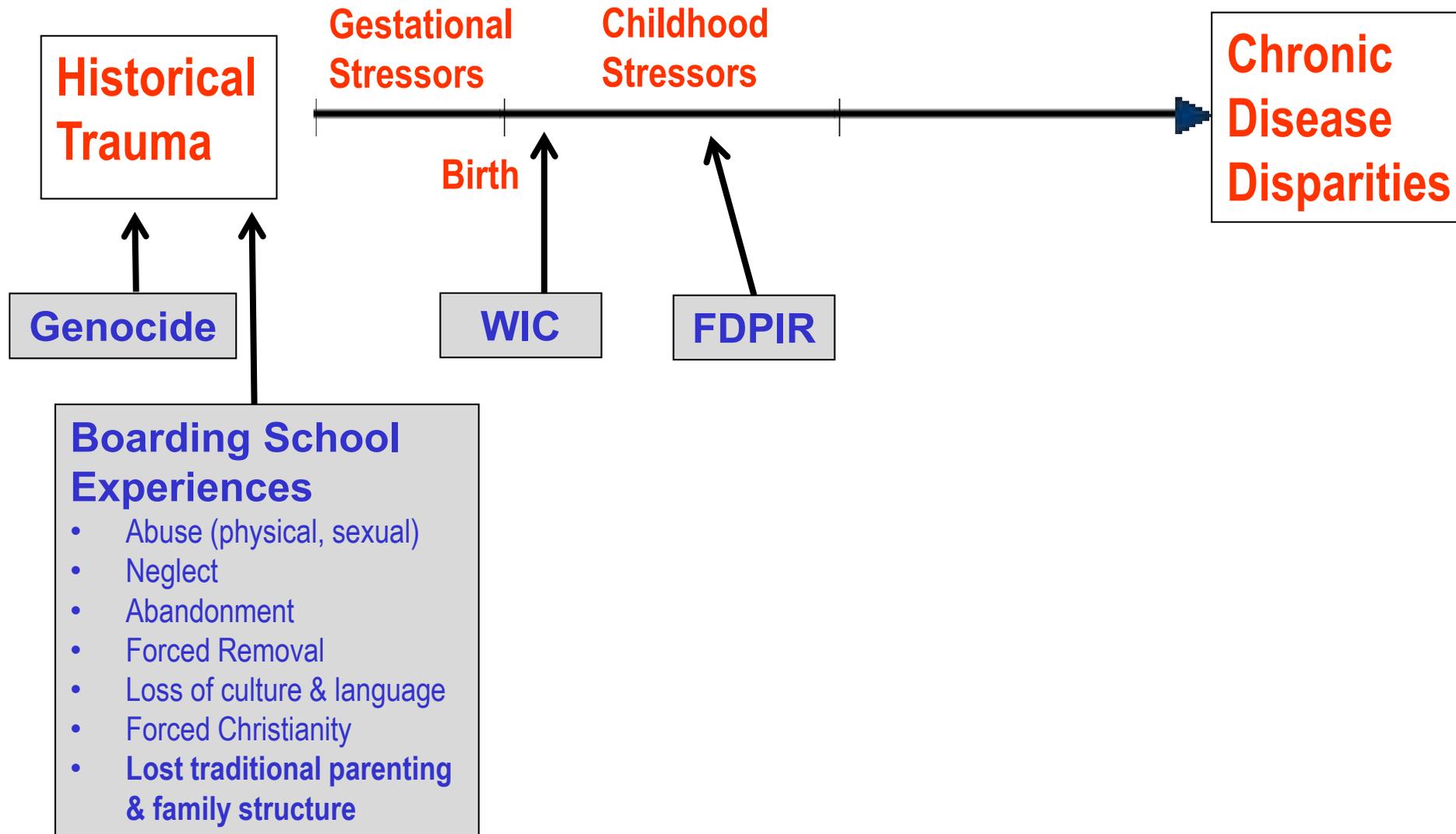
ALVAN
SIOUX
MARCH 22 1881

MARGARET
DAVIS
DEC 18 18 18 18 18

FRANK
GREEN
ONIDA
MAY 18 18 18 18

EDNA
BETANK
MAY 18 18 18 18

Inter-Generational Basis for Chronic Disease Disparities Among American Indians and Alaska Natives











@MacarioAeugus



Intergenerational Nutritional Effects

“Nutritional Epigenetics”
&
Developmental Origins of Health
and Disease

Illinois Study

Coutinho et al. Am J Epi, 1997 146:804-809

- N=15,287 Black and 117,708 white matched pairs of infants and mothers.
- Mothers were born between 1956-75, infants between 1989-1991

	Black	White
Mean infant birthweight	3139 g	3434
Mean parental birthweight	3133	3377
% low birthweight infants	12%	5%
% lbw born to women with lbw	18%	9%
% lbw born to women not lbw	11%	5%

Results

- Father's birthweight had effect on infant birthweight but not as strong as mothers.
- Each 100 g increase in maternal birthweight was associated with 24-27 g increase in infant birthweight.

Dutch Famine Studies

Susser and Stein, Nutrition Reviews, 1994

- Dutch famine winter lasted 6 months, from November 1944-when nazis imposed transport embargo on west Holland until-
- May 7, 1945 when Holland was liberated from the occupation
- Strong evidence for critical stages of development in several physiological systems

Affects of Famine

- Fertility decreased
- Maternal weight fell during pregnancy with famine exposure
- Third trimester famine exposure had strong effect on birthweight
- Third trimester famine exposure was associated with infant mortality

Obesity in Young Men after Famine Exposure in Utero and early Infancy

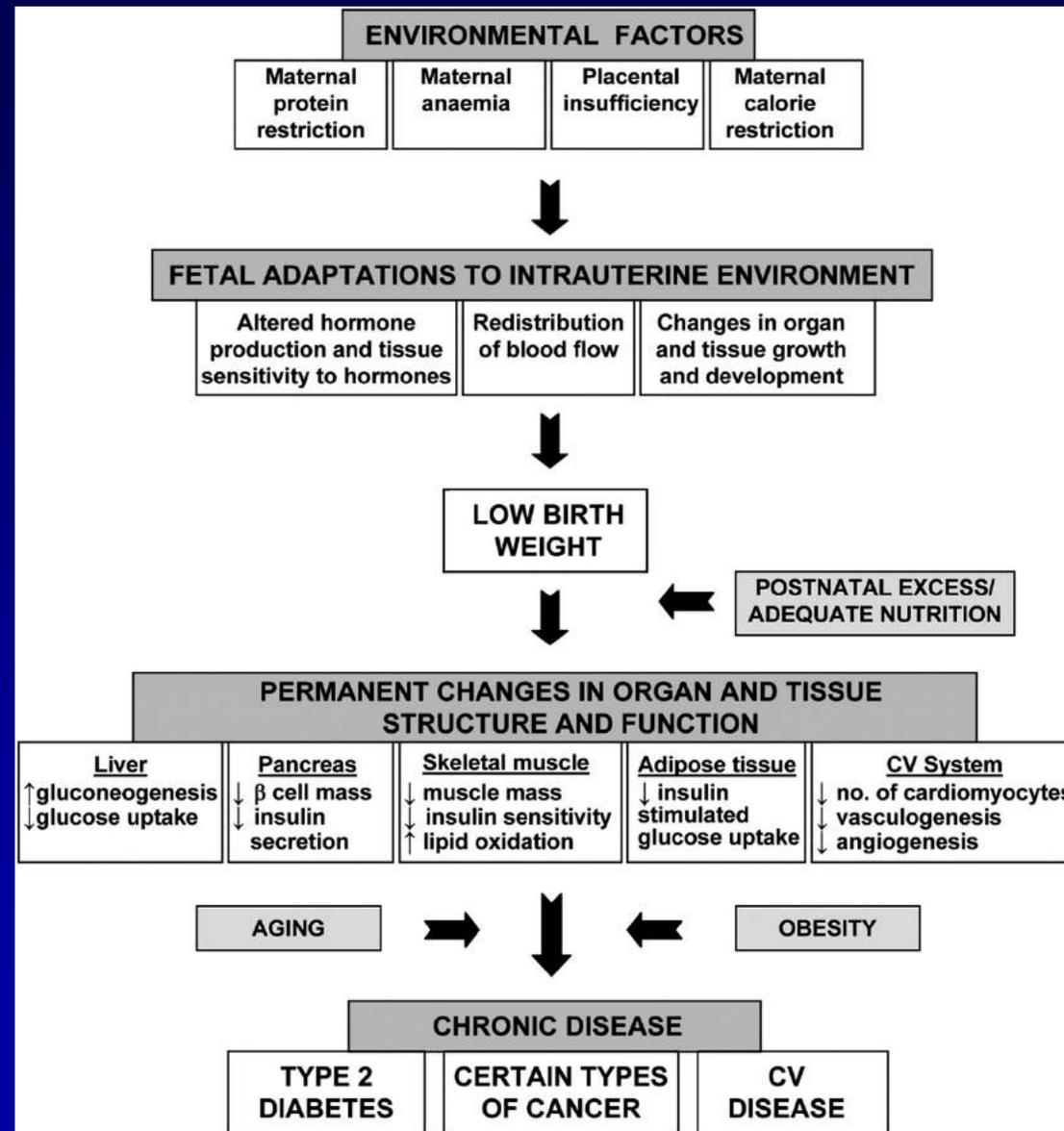
(Ravelli et al NEJM, 1976)

- N=300, 000 Dutch military inductees at age 19
- Famine exposure in first 2 trimesters lead to 80% higher prevalence of overweight ($p < 0.0005$)
- Famine exposure in last trimester or famine exposure in first 5 months of life associated with 40% lower prevalence of overweight ($p < 0.005$)

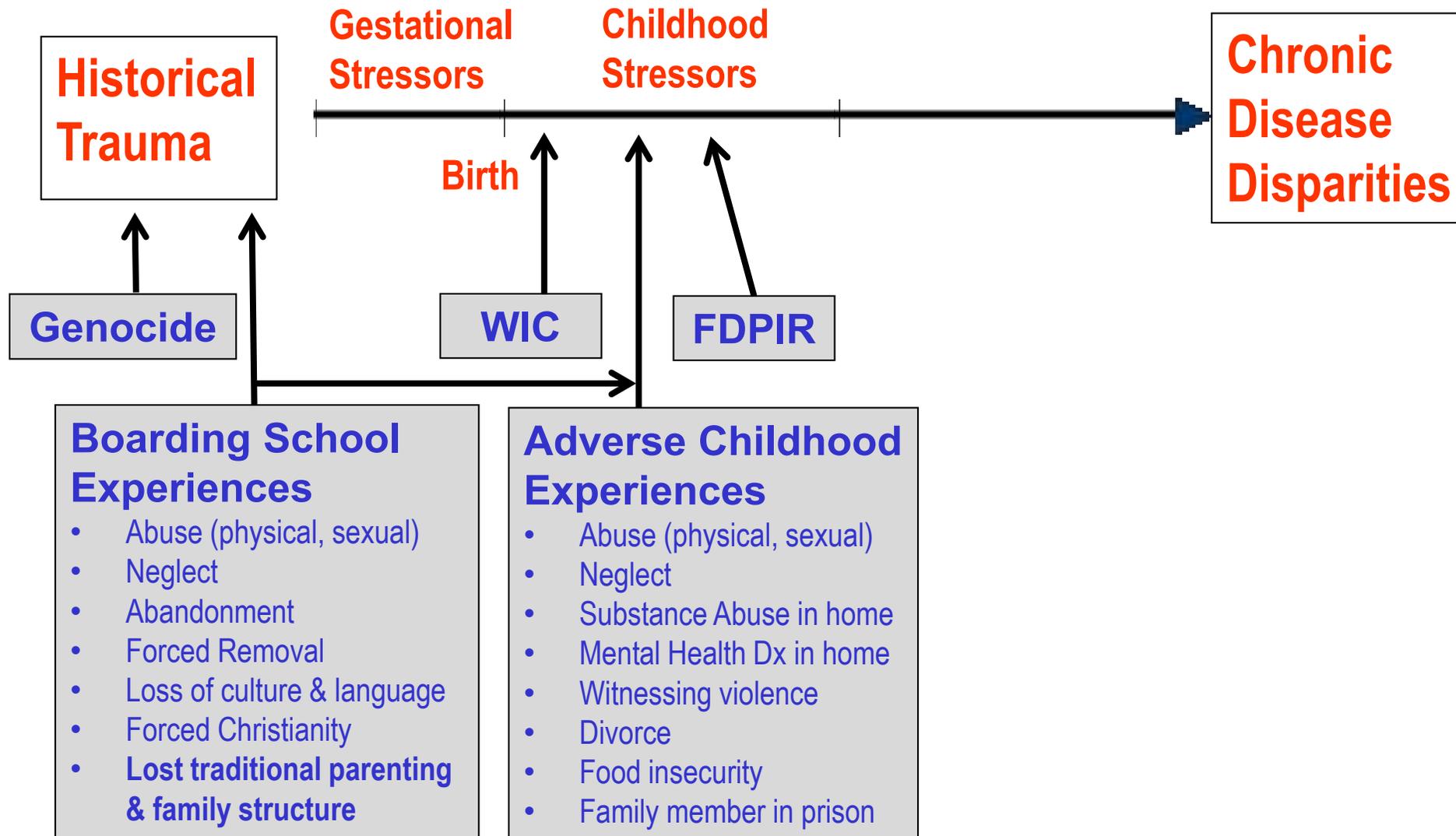
Intergenerational Impacts of Dutch Famine

<p>Mother's exposure to famine prior to conception was associated with lower self-reported measures of <i>mental health and quality of life in her adult offspring.</i></p>	<p>Stein et al. Epidemiology. 2009 Nov;20(6):909-15</p>
<p>Children born to women who were exposed to famine while they were in utero have increased neonatal adiposity and poor health 1.8 times more frequently in later life</p>	<p>Painter et al. BJOG, 2008 Sep;115(10):1243-1249.</p>

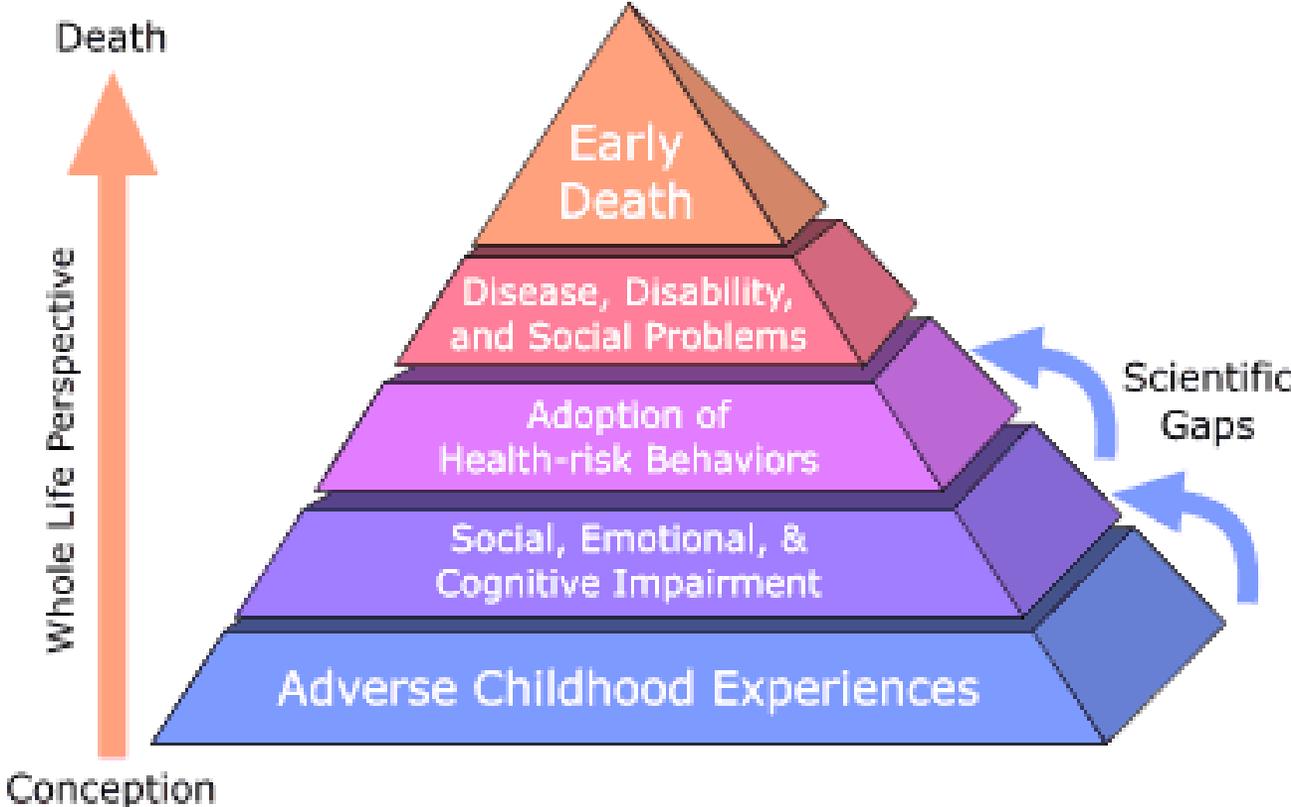
Developmental programming of type 2 DM and CVD



Inter-Generational Basis for Chronic Disease Disparities Among American Indians and Alaska Natives



ACE Study Pyramid



Impact of ACEs on Health

ACES can have lasting effects on....



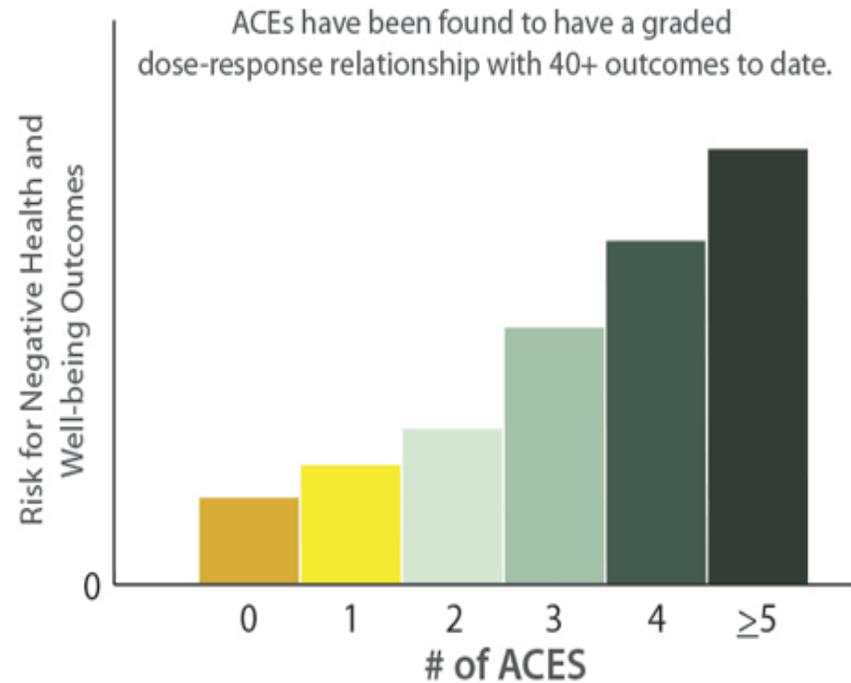
Health (obesity, diabetes, depression, suicide attempts, STDs, heart disease, cancer, stroke, COPD, broken bones)



Behaviors (smoking, alcoholism, drug use)

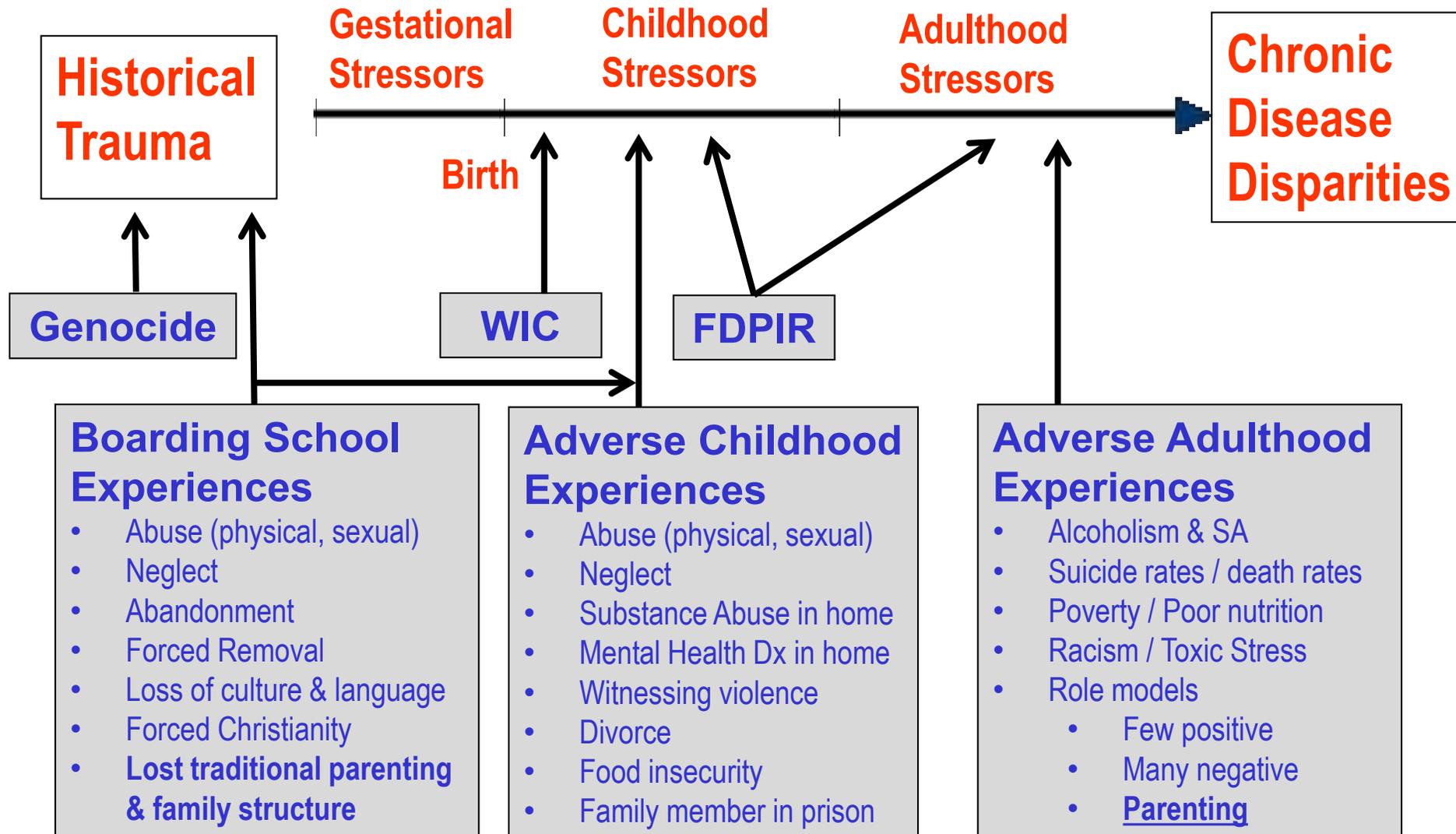


Life Potential (graduation rates, academic achievement, lost time from work)

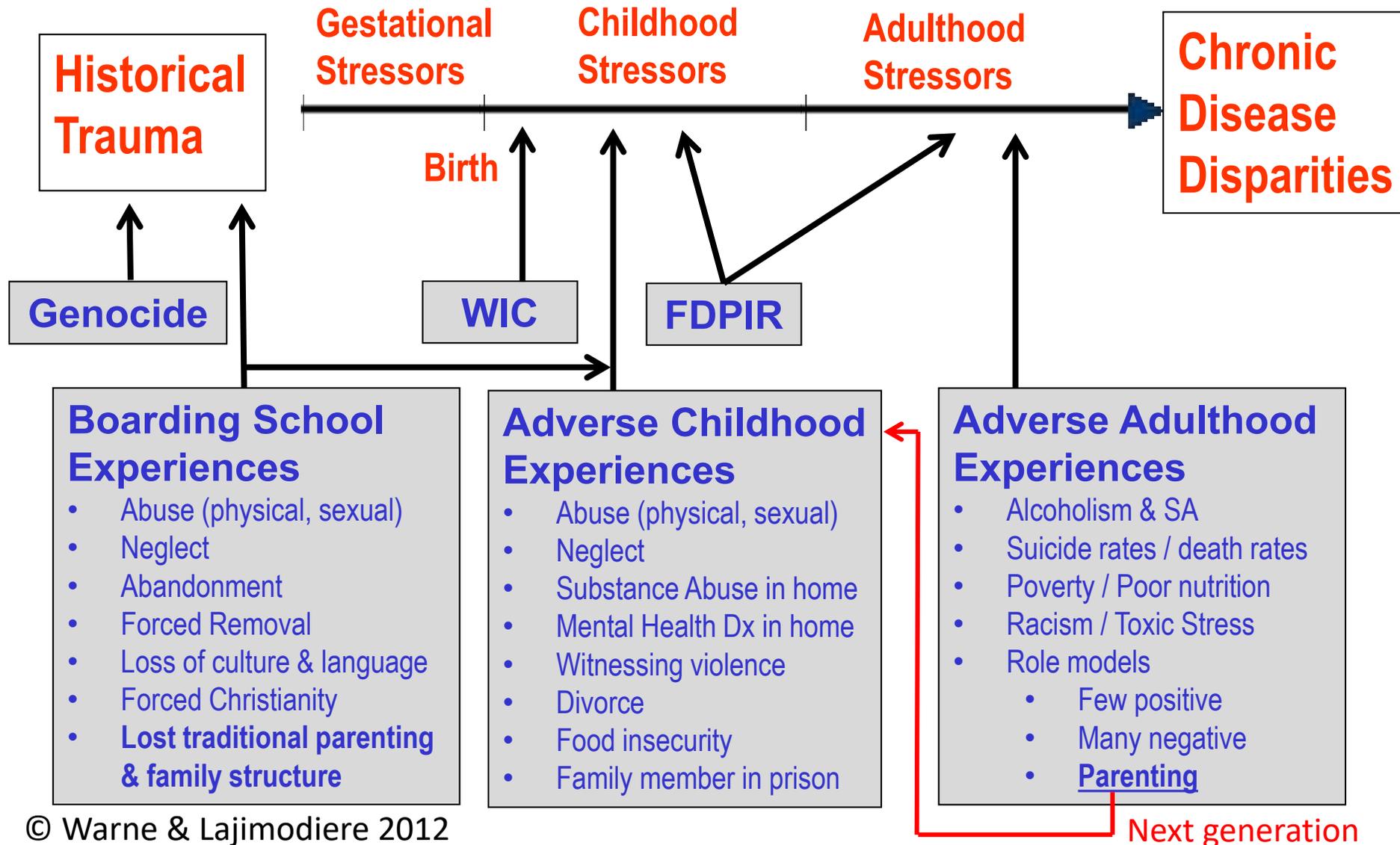


*This pattern holds for the 40+ outcomes, but the exact risk values vary depending on the outcome.

Inter-Generational Basis for Chronic Disease Disparities Among American Indians and Alaska Natives



Inter-Generational Basis for Chronic Disease Disparities Among American Indians and Alaska Natives



South Dakota Health Survey

The survey included questions on:

- Basic information, including age, sex, race;
- Self-reported health status, including chronic diseases, depression, and other health issues;
- Mental Health Screening;
- Access to services, including cost, distance, and other access issues; and
- Adverse Childhood Experiences.

	AI	Non-AI	Total	p-value
Employment status				<u><.0001</u>
Not employed	31.60%	7.58%	9.64%	
Employed part time	11.91%	19.63%	18.97%	
Employed full time	49.59%	54.47%	54.05%	
Retired	6.89%	18.31%	17.34%	
Income (%FPL)				<u><.0001</u>
<50% FPL	38.90%	12.73%	15.17%	
50–138% FPL	22.48%	10.18%	11.33%	
138–250% FPL	17.29%	22.46%	21.98%	
250–400% FPL	11.13%	28.75%	27.11%	
>400% FPL	10.20%	25.88%	24.42%	
Education				<u><.0001</u>
Less than high school	9.95%	3.23%	3.85%	
High school diploma or GED	39.29%	32.40%	33.05%	
Vocational or 2-yr. degree	24.86%	23.87%	23.96%	
4-year college degree	22.47%	25.69%	25.39%	
Advanced or graduate degree	3.44%	14.81%	13.75%	

Adverse Childhood Experiences <i>Domains</i>	American Indian (n = 516)	Non-American Indian (n = 7078)	Significance
Abuse			
Emotional Abuse	30.10%	17.41%	.0008*
Physical Abuse	24.51%	12.31%	.0002*
Sexual Abuse	15.53%	9.60%	.0263*
Neglect			
Emotional Neglect	25.87%	14.00%	.0005*
Physical Neglect	15.89%	2.78%	<.0001*
Household Dysfunction			
Mother Treated Violently	23.76%	5.31%	<.0001*
Household Substance Abuse	50.04%	21.49%	<.0001*
Household Mental Illness	24.36%	13.89%	.0032*
Parental Separation or Divorce	39.34%	20.17%	<.0001*
Incarcerated Household Member	22.57%	3.73%	<.0001*

AI ACE Disparities in South Dakota

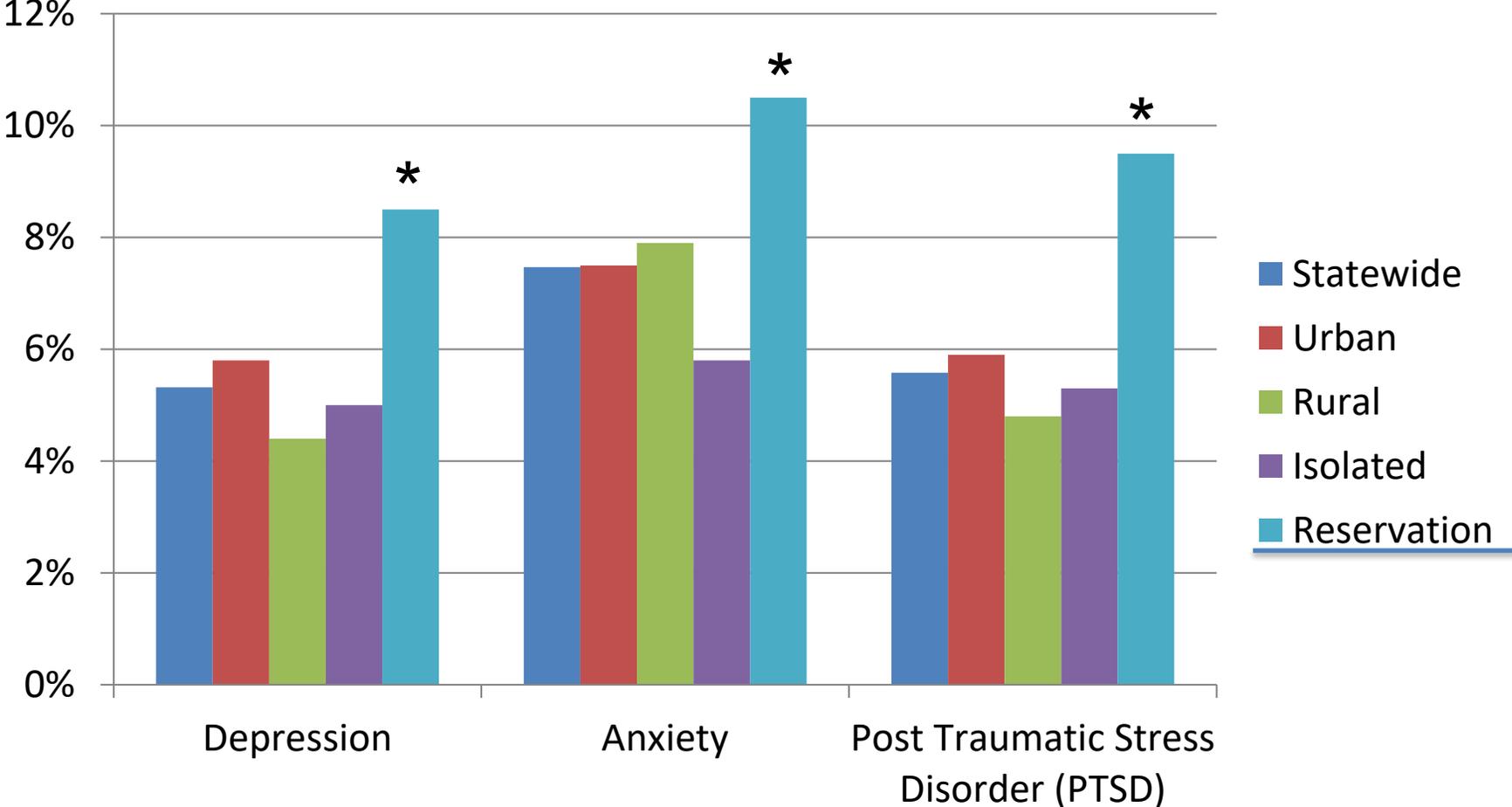
	<u>AI</u>	<u>Non-AI</u>	<u>p-value</u>
Number of ACEs (Score)			<u><.0001*</u>
0	16.84%	50.02%	
1	21.59%	23.02%	
2	16.20%	9.60%	
3	12.99%	6.09%	
4-5	13.10%	7.38%	
≥6	19.28%	3.89%	

Note

*statistically significant

Prevalence: Mental Health Screens

Participants who screened positive for a condition using standardized mental health screening tools



Research and Programming Needs

- Improve understanding of Historical Trauma, Epigenetics, and Nutritional Epigenetics
- How do we prevent ACEs?
 - Home visiting, parenting skills, community engagement
 - *Is poor nutrition an ACE?*
- How do we mitigate the impact of HT and ACEs?
- Develop a Diverse Workforce
- UND INMED & MPH Program
- PhD in Indigenous Health

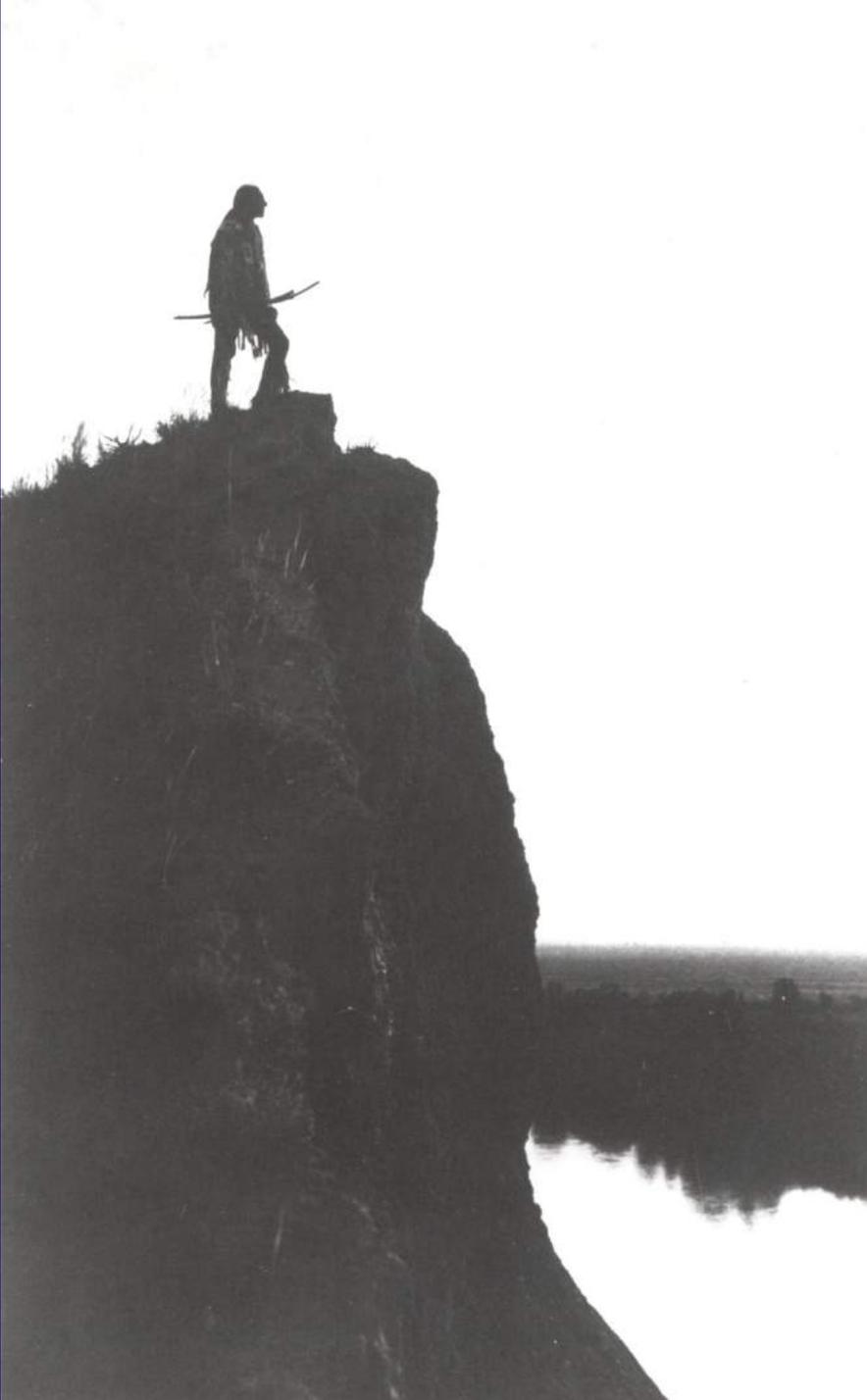


Blackfeet Saying

A child is sacred. And when that child comes into the home, the family must welcome it. And if the child is happy and feels the want, he will come into this world very, very strong. And not to know this is to know nothing.







Donald Warne

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