

Prenatal and Early Life Risk Factors for Obesity



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Indian Health Service

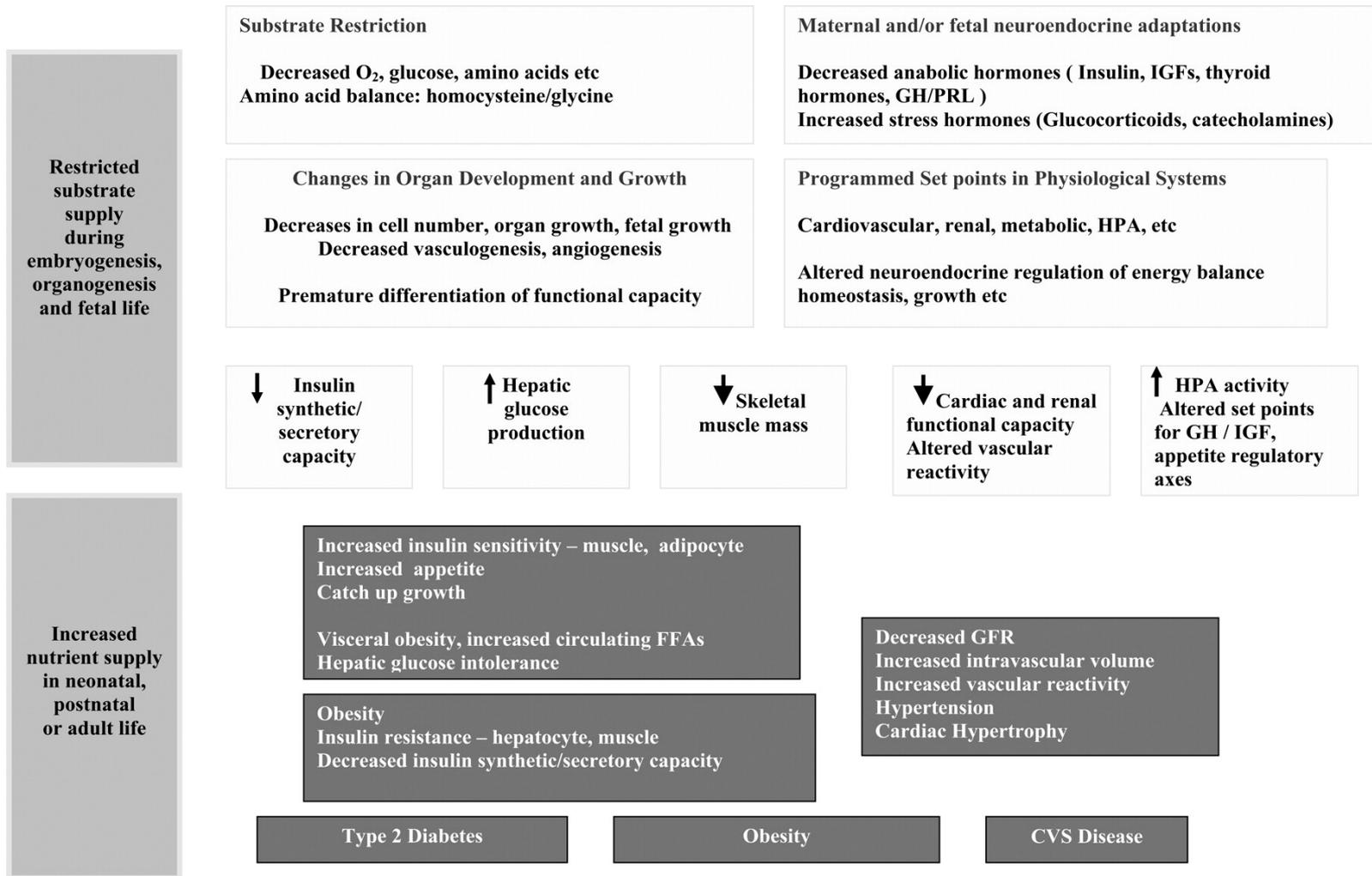
Today's Webinar

- Overview of *in utero* and early life risk factors for obesity
- Evidence for intervention during these periods
- Family Spirit home visiting intervention
 - Description
 - Recently published outcomes and how they relate to reducing obesity risk factors

“The exquisite system for regulation of energy balance is established just once in each individual’s life. In addition to the instructions laid down in the genetic blueprint, environmental influences during critical ontogenic periods determine the outcome of this process, with permanent consequences for body weight regulation.”

Annu Rev Nutr 2014;34:337-355, pg. 350

FIG. 7. The physiological mechanisms underlying the programming of the separate and combined elements of the metabolic syndrome



Maternal Stress and Nutrition in Pregnancy Increase Offspring Obesity Risk

J Nutr Metab 2012; 2012: 632548

- Fetuses of obese mothers develop insulin resistance in utero
Diabetes Care 2009;32:1076-1080
- Maternal diet during pregnancy:
 - Epigenetically affects child's adiposity at age 9 yrs
Diabetes 2011;60:1528-1534

"Our findings suggest a substantial component of metabolic disease risk has a prenatal developmental basis."
- Maternal stressful life events during 1st trimester increase the risk of preterm birth (OR 2.4) and SGA
Am J Obstet Gynecol 2010;203:34.e1-8
- Inverse association between gest age and insulin levels at birth and early childhood
JAMA 2014;311:587-596
- Both SGA and preterm birth are strongly associated with later risk for chronic disease
Diabetes 2009;58:523-526

Adverse Childhood Experiences (ACE)

- Physical, emotional, sexual abuse; mentally ill, substance abusing, incarcerated family member; seeing mother beaten; parents divorced/separated

--Overall Exposure: 86% (among 7 tribes)

	Non-Native	Native
Physical Abuse-M	30%	40%
Physical Abuse-F	27	42
Sexual Abuse-M	16	24
Sexual Abuse-F	25	31
Emotional Abuse	11	30
Household alcohol	27	65
Four or More ACEs	6	33

Am J Prev Med 2003;25:238-244

ACEs and Adult Health

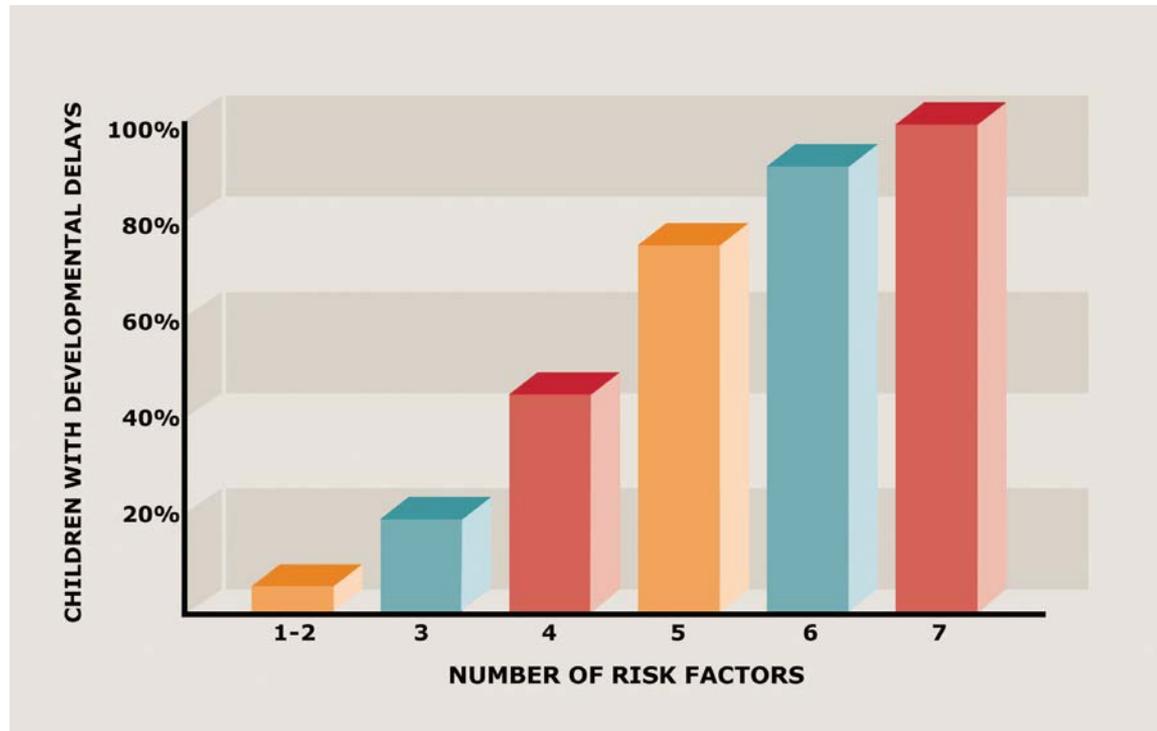
- ACE Score ≥ 4
 - 4-12 x risk for alcoholism, drug abuse, depression and suicide attempt
 - 2-4 x risk for smoking, teen pregnancy, STDs, multiple sexual partners
 - 1.4-1.6 x risk for severe obesity
 - Strong graded relationship at ***all*** levels of ACEs for almost all outcomes, including heart disease

Am J Prev Med 1998;14:245-258 and *Circulation* 2004;110:1761-6

- Across 10 countries, adults who experienced ≥ 3 childhood adversities
 - Hazard ratios 1.59 for diabetes, 2.19 for heart disease
 - ***Risk similar to the association between cholesterol and heart disease***
 - Both in magnitude as well as population prevalence

Arch Gen Psychiatry 2011;68:838-844

90-100% Chance of Developmental Delays When Children Experience 6-7 Risk Factors



Center on the Developing Child at Harvard website

Source: Barth, et al (2008)

Stress in Children

- **Positive**
 - Normal/necessary part of healthy development
 - First day with new caregiver; immunization
 - Brief increases in heart rate and stress hormones
- **Tolerable**
 - More severe, longer lasting stressor
 - Loss of a loved one, natural disaster, injury
 - If buffered by relationship with supportive adult(s), brain and body can recover
- **Toxic**
 - Strong, frequent, prolonged adversity
 - Abuse, neglect, caregiver mental illness, poverty
 - If no adult support, can disrupt brain and organ development long-term

Center on the Developing Child at Harvard Univ.

Domains of Impairment in Children Exposed to Complex Trauma

SIDEBAR 1.

Domains of Impairment in Children Exposed to Complex Trauma

I. Attachment	IV. Dissociation	VI. Cognition
<ul style="list-style-type: none"> Problems with boundaries Distrust and suspiciousness Social isolation Interpersonal difficulties Difficulty attuning to other people's emotional states Difficulty with perspective taking 	<ul style="list-style-type: none"> Distinct alterations in states of consciousness Amnesia Depersonalization and derealization Two or more distinct states of consciousness Impaired memory for state-based events 	<ul style="list-style-type: none"> Difficulties in attention regulation and executive functioning Lack of sustained curiosity Problems with processing novel information Problems focusing on and completing tasks Problems with object constancy Difficulty planning and anticipating Problems understanding responsibility Learning difficulties Problems with language development Problems with orientation in time and space
II. Biology	V. Behavioral control	VII. Self-concept
<ul style="list-style-type: none"> Sensorimotor developmental problems Analgesia Problems with coordination, balance, body tone Somatization Increased medical problems across a wide span (eg, pelvic pain, asthma, skin problems, autoimmune disorders, pseudoseizures) 	<ul style="list-style-type: none"> Poor modulation of impulses Self-destructive behavior Aggression toward others Pathological self-soothing behaviors Sleep disturbances Eating disorders Substance abuse Excessive compliance Oppositional behavior Difficulty understanding and complying with rules Reenactment of trauma in behavior or play (eg, sexual, aggressive) 	<ul style="list-style-type: none"> Lack of a continuous, predictable sense of self Poor sense of separateness Disturbances of body image Low self-esteem Shame and guilt
III. Affect regulation		
<ul style="list-style-type: none"> Difficulty with emotional self-regulation Difficulty labeling and expressing feelings Problems knowing and describing internal states Difficulty communicating wishes and needs 		

Stress in Children and Obesity Risk

- Chronic exposure to Intimate Partner Violence almost doubles (OR 1.8) risk of obesity at age 5 years

Arch Pediatr Adolesc Med 2010;164:540-546

- Young children who had objectively-measured poor quality maternal-child relationships had 2 ½ x increased prevalence of **adolescent** obesity c/w those who did not

Pediatrics 2012;129:132-40

- Children who experienced multiple negative life events are at higher risk of being overweight by age 15 years

Pediatrics 2013;132(6):e1506-12

“We ...know that sound maternal and fetal nutrition, combined with positive social-emotional support of children through their family and community environments, will reduce the likelihood of negative epigenetic modifications that increase the risk of later physical and mental health impairments.”

Center on the Developing Child at Harvard University

Working Paper 10, 2010

Reducing Poverty and its Effects

- Opening or expanding tribal casinos was associated with increased economic resources and decreased child obesity and overweight
JAMA 2014;311:929-936
- “Growing up in a family that is struggling economically in a neighborhood that is plagued with failed schools, crime, disorder, and violence creates cumulative health risks and functional deficits that contribute to higher rates of many health conditions, including asthma, attention-deficit/hyperactivity disorder, and obesity. Without a coherent and functional system of high-quality services such as child care, early education, family support, health care, and mental health services, risks go unaddressed, preventable health problems develop, and disabling conditions compound over time, becoming more pronounced as sick and impaired teens become chronically ill and disabled adults.”
Neal Halfon, JAMA 2014;311:915-917

Prenatal/Early Life Home Visiting

- One of the key evidence-based interventions proven to improve the life trajectories of low income women and children
 - Positive effects now shown up to age 19 years

Arch Pediatr Adolesc Med 2010;164:9-15, 412-418, 419-424

- Tribal Maternal, Infant & Early Childhood Home Visiting Program (MIECHV)
 - 25 tribes/T.O.'s now funded to provide home visiting

Academic Achievement and Preschool Language Scale



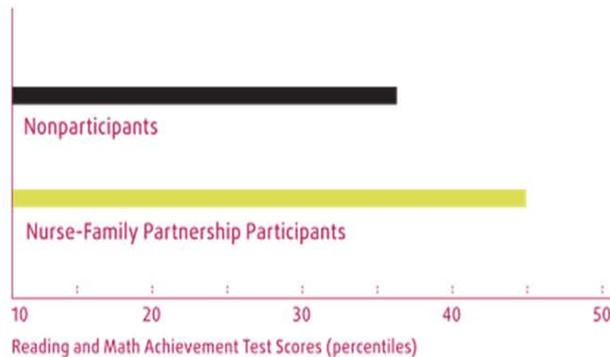
Academic Achievement

Grades 1–3, Age 9—Memphis
(Born to low-resource mothers)

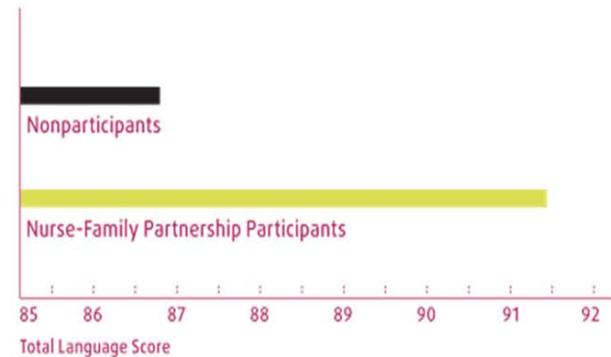


Preschool Language Scale

Age 4—Denver
(Born to low-resource mothers)



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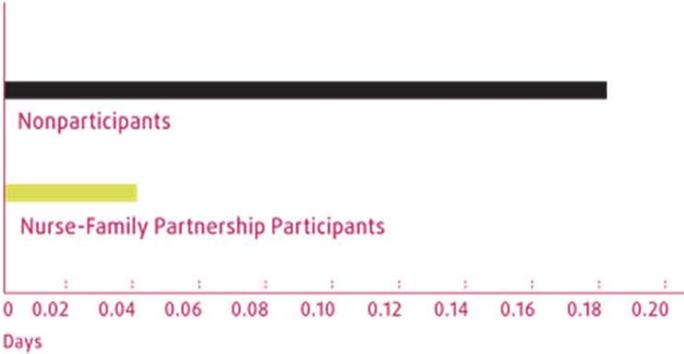
Source: Reproduced with permission from *Pediatrics*, Vol. 114, 1565, Copyright © 2004 by the AAP.

Days Hospitalized for Injuries and Months Between Births



Days Hospitalized for Injuries

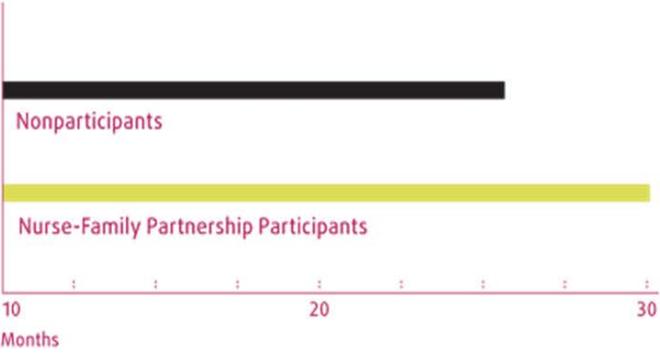
Birth to age 2—Memphis



Source: JAMA, 1997, Vol. 278, 650, Copyright © 1997, American Medical Association. All rights reserved.

Months Between Births

Between first and second child (by first child's fifth birthday)—Memphis



Source: JAMA, 2000, Vol. 283, 1987, Copyright © 2000, American Medical Association. All rights reserved.

Months Receiving Welfare Assistance and Months receiving Food Stamps



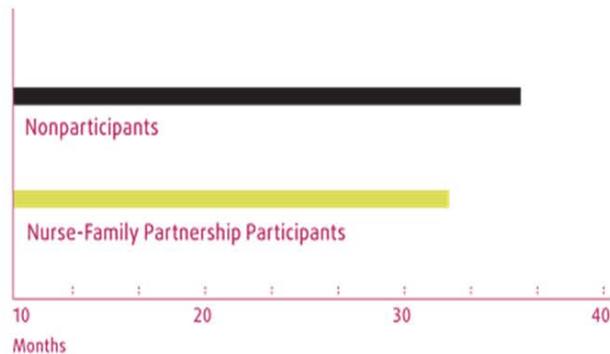
Months Receiving Welfare Assistance (AFDC)

Birth through age 5—Memphis

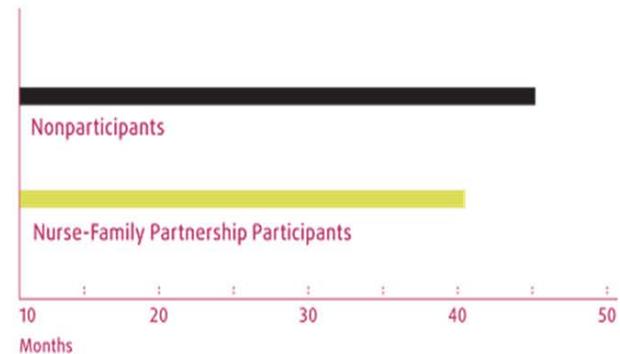


Months Receiving Food Stamps

Birth through age 5—Memphis

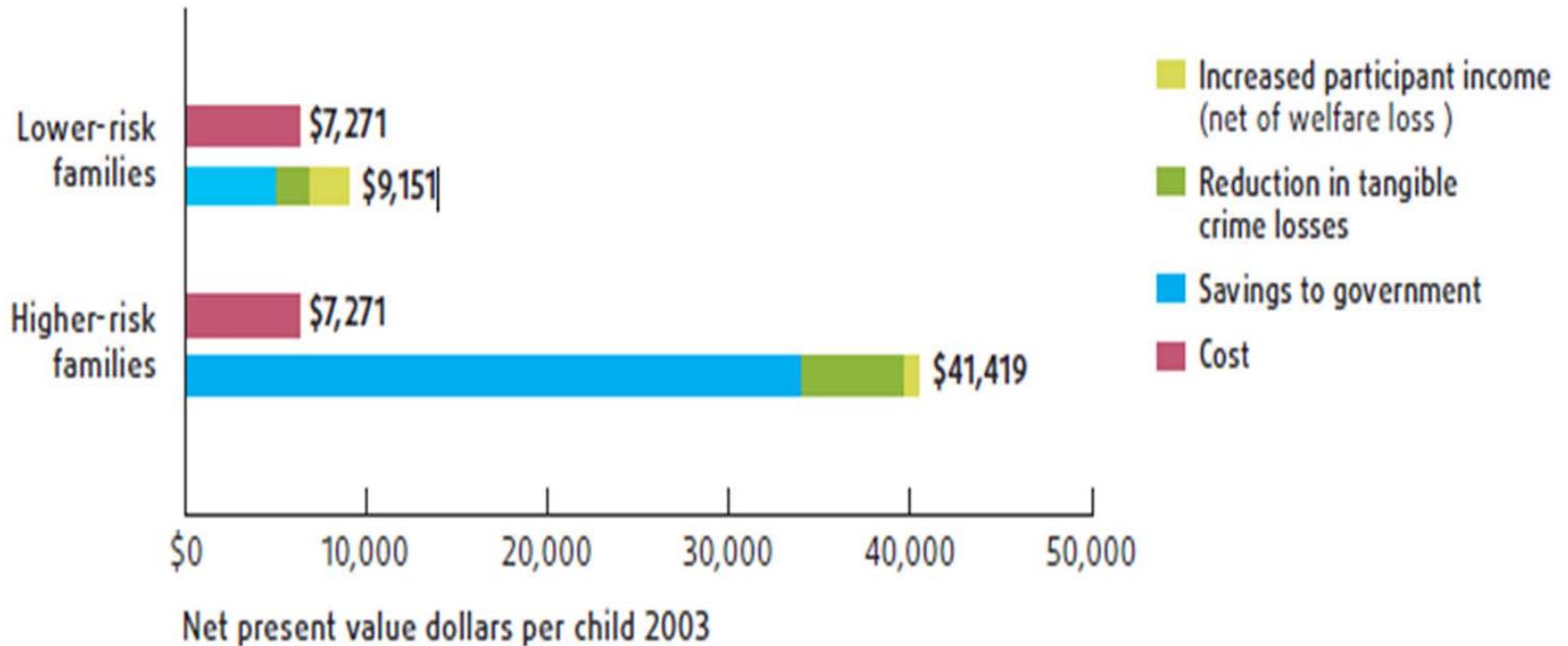


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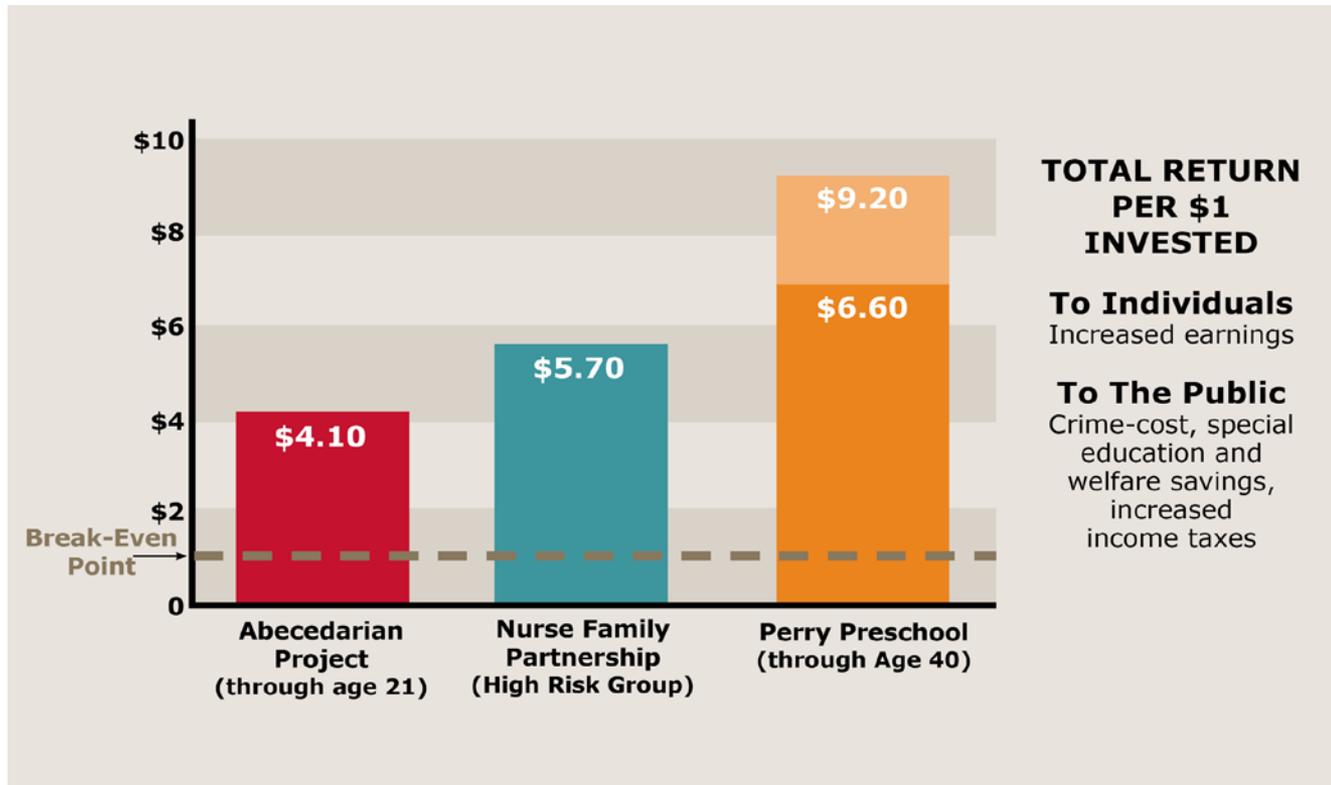
Source: JAMA, 2000, Vol. 283, 1987, Copyright © 2000, American Medical Association. All rights reserved.

Monetary Benefits



Source: 2005 RAND Corporation Study

\$4-\$9 in Returns for Every Dollar Invested in Early Childhood Programs



Center on the Developing Child at Harvard website

Sources: Masse, L. and Barnett, W.S., A Benefit Cost Analysis of the Abecedarian Early Childhood Intervention (2002); Karoly et al., Early Childhood Interventions: Proven Results, Future Promise (2005); Heckman et al., The Effect of the Perry Preschool Program on the Cognitive and Non-Cognitive Skills of its Participants (2009)

“Early Life Investments Substantially Boost Adult Health”

- Carolina Abecedarian Project
 - 4 cohorts of disadvantaged children born 1972-77
 - Intervention provided from birth to age 5 years
 - Intervention:
 - Development of language, emotional regulation, cognitive skills
 - Caregiving/supervised play
 - Nutrition: 2 meals and a snack at childcare center
 - Primary pediatric care
- In their mid-30s: lower prevalence of CVD and metabolic disease risk factors including BP, A1C, obesity, HDL

Science 2014;343:1478-1485

“...reducing toxic stress can target the common physiologic pathway implicated in an enormous array of health outcomes from asthma to cardiovascular disease.”

Pediatrics 2013;131:319-327

Going Forward—What Works?

- Exposures in the *in utero* and early life periods have significant impact on later obesity risk
 - Risk factors and associations are being defined
 - Mechanisms are starting to be understood
- Intervention research is in its infancy, but part of the picture is emerging.
 - Early, intensive interventions can reduce some of the risk factors for later obesity
 - Do they reduce obesity itself?
 - Family Spirit



Advancements in Diabetes:
Reducing Risk Factors for Obesity Early in Life

Allison Barlow, MA, MPH, PhD and Jennifer Richards, MPH

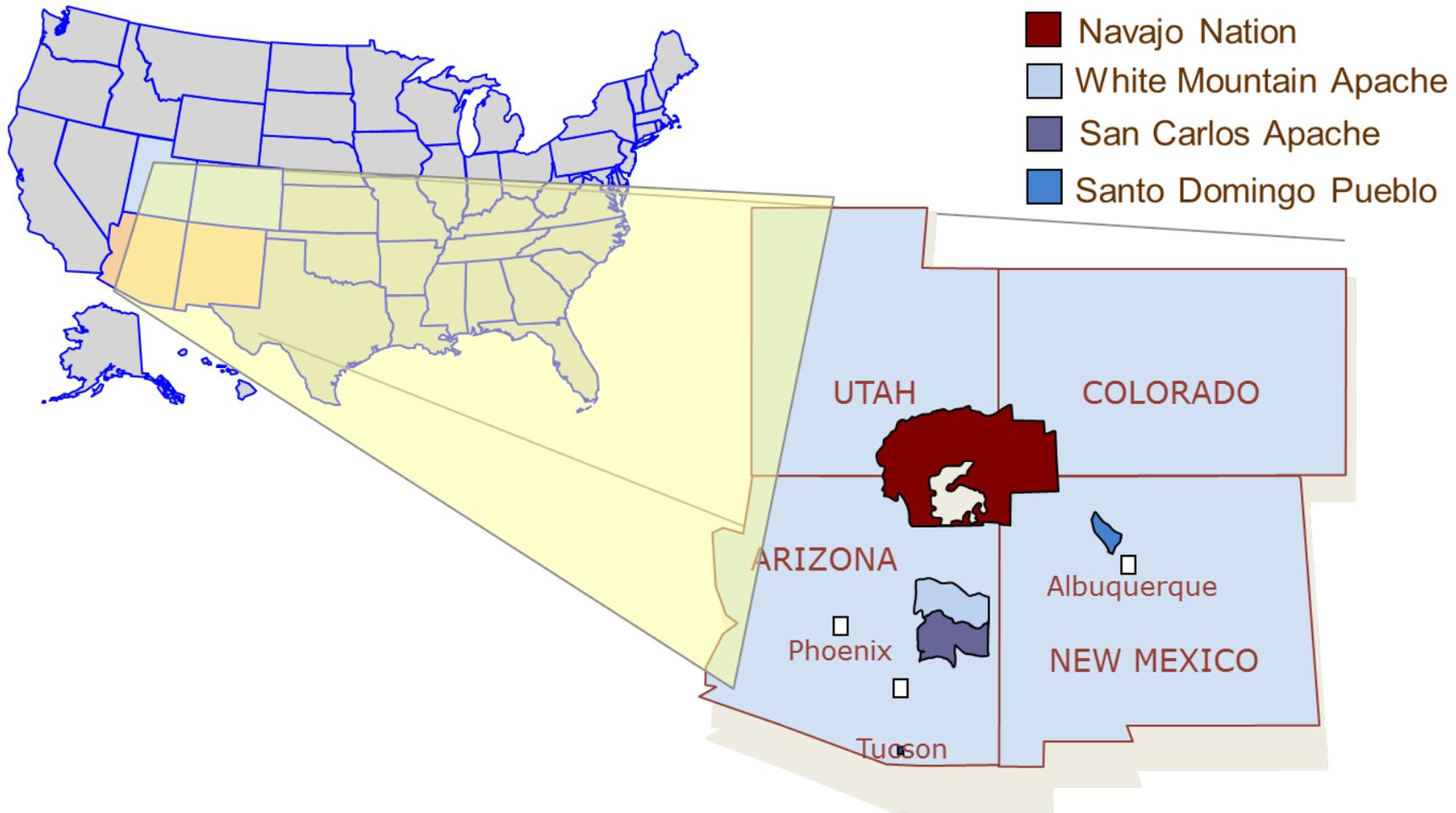
John Hopkins Center for American Indian Health

For more than three decades we have partnered with American Indian Communities to co-design program to achieve optimal health and well-being across the lifespan.

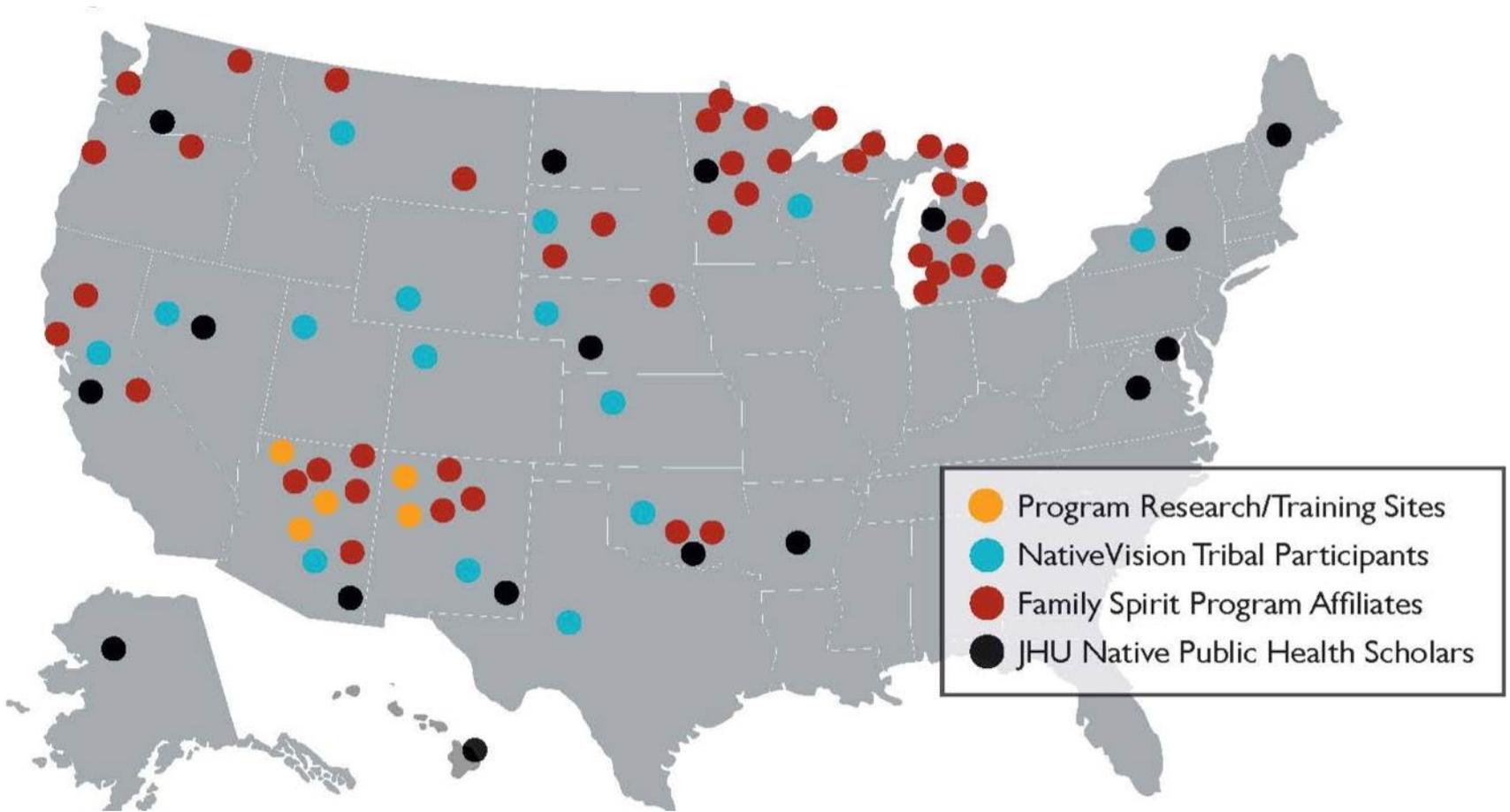
MOU with IHS since 1991.



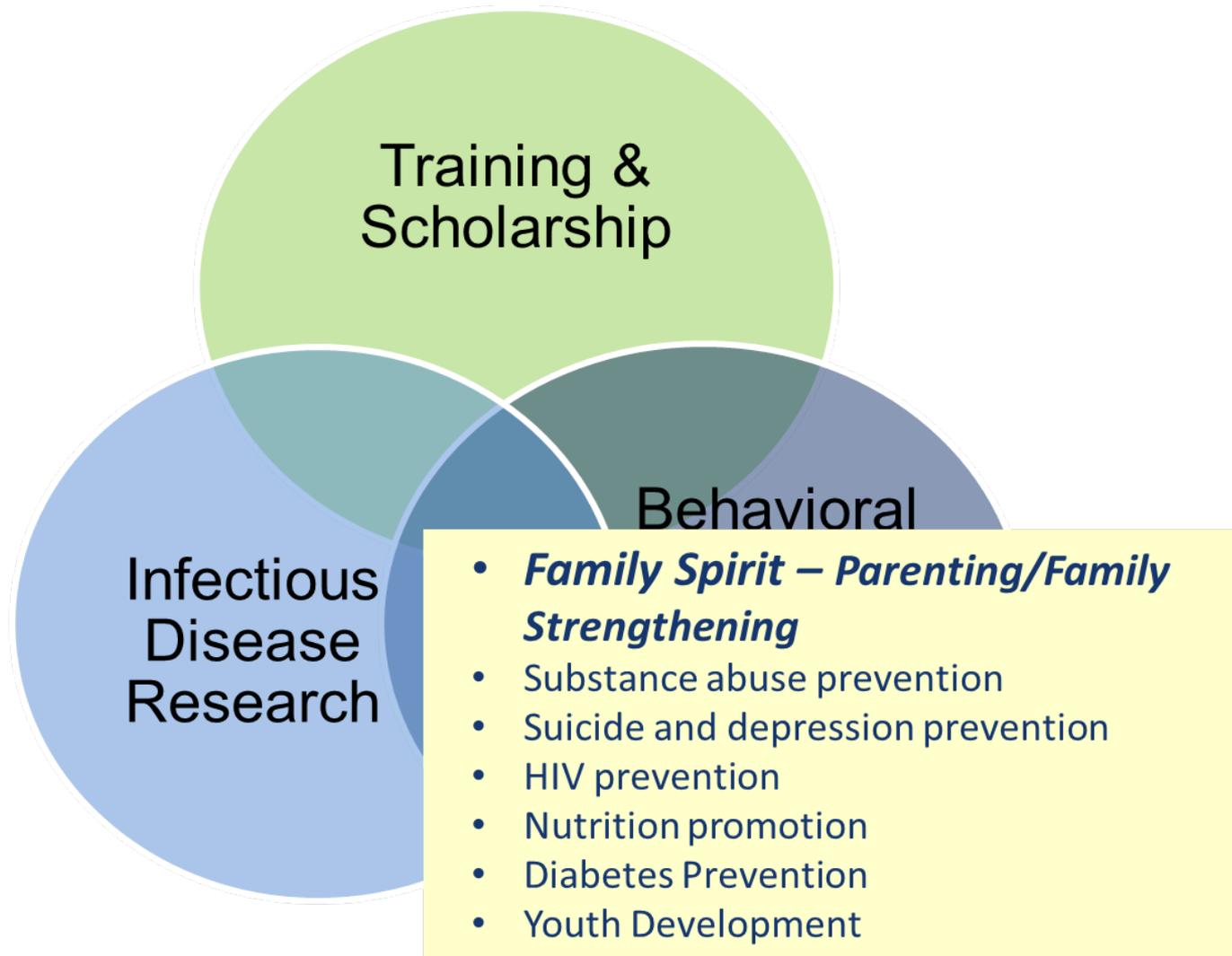
Our Center's 3 decade partnership with Southwestern tribal communities



Our Center's present scope



John Hopkins Center for American Indian Health



A changing landscape...

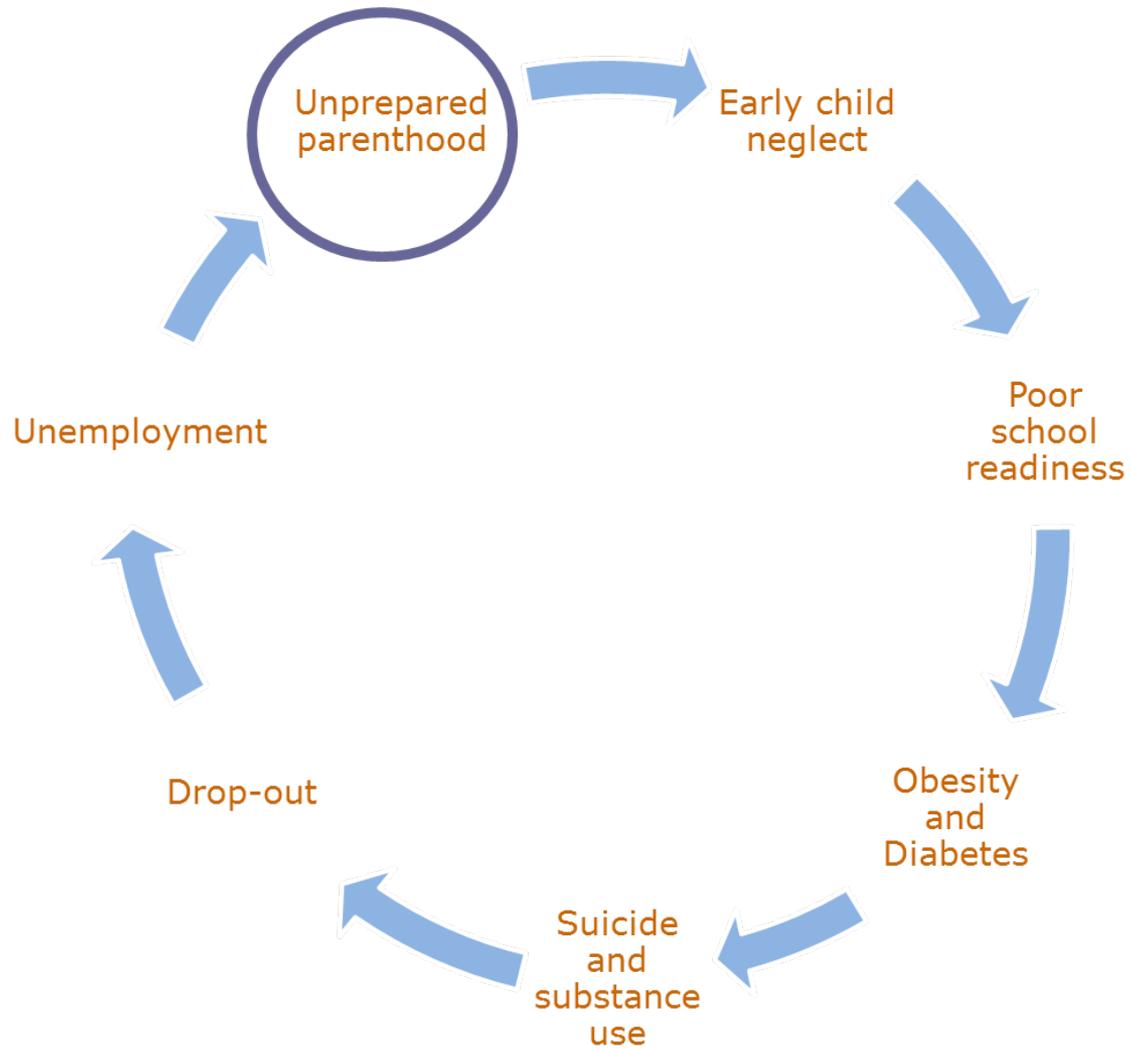


Major shift from
high infectious
disease mortality
to

Behavior and
mental health
inequalities

Low education,
employment,
modern trauma,
fractured families

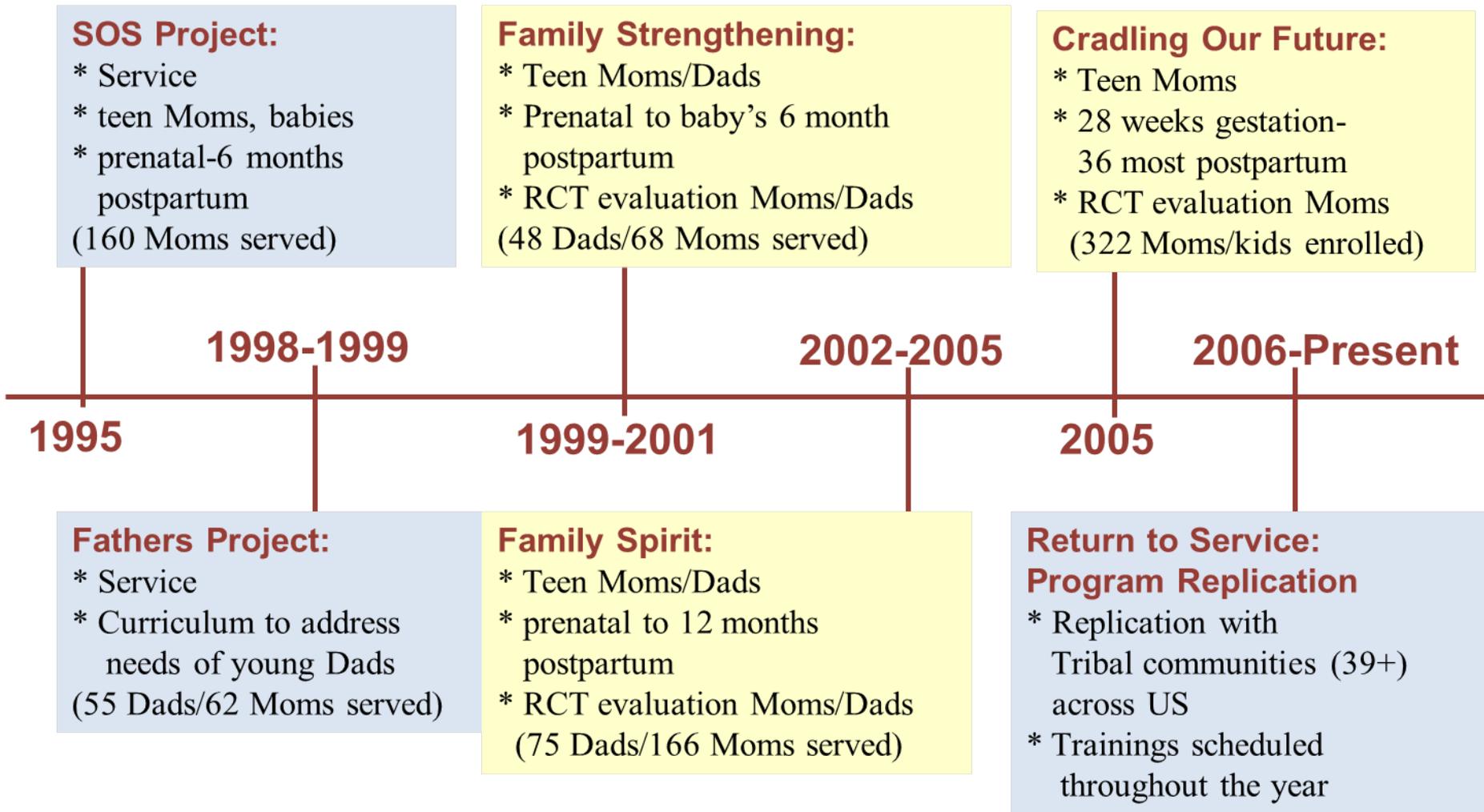
How do we break this cycle?



An indigenous solution: Family Spirit home visiting program



Family Spirit Program History



SOS Project:

- * Service
- * teen Moms, babies
- * prenatal-6 months postpartum
- (160 Moms served)

Family Strengthening:

- * Teen Moms/Dads
- * Prenatal to baby's 6 month postpartum
- * RCT evaluation Moms/Dads
- (48 Dads/68 Moms served)

Cradling Our Future:

- * Teen Moms
- * 28 weeks gestation-36 most postpartum
- * RCT evaluation Moms
- (322 Moms/kids enrolled)

Fathers Project:

- * Service
- * Curriculum to address needs of young Dads
- (55 Dads/62 Moms served)

Family Spirit:

- * Teen Moms/Dads
- * prenatal to 12 months postpartum
- * RCT evaluation Moms/Dads
- (75 Dads/166 Moms served)

Return to Service: Program Replication

- * Replication with Tribal communities (39+) across US
- * Trainings scheduled throughout the year

Family Spirit Intervention



Home-Based Outreach



Family Involvement



Structured, home-based curriculum taught by AI Home Visitors to young mothers from pregnancy – 36 mos post-partum



Community Referrals

Curriculum Overview



Family Spirit: Key Content



- Goal-Setting
- Parenting and Well-Child Care
- Reproductive Health
- Nutrition/Responsive Feeding
- Establishing Meal Time/Sleep Routines
- Oral Health
- Family Planning
- Substance Abuse & Depression Prevention/Referral
- Conflict and problem Solving
- School/Career Planning
- Budgeting for One's Family
- Preparing Young Children for School

Tapping Cultural Assets



- **Children are sacred**
- **Matrilineal societies**



- **Changing woman**
- **Sunrise Ceremony, Kinaalda**

Culturally Grounded Content and Format

- “Familiar” stories create **dialogue** between Family Health Educator and mom to solve problems
- Illustrations by Apache-Navajo artist
- Out-takes for local cultural activities and additional resources



Cultural Community Components for Adaptation



- Traditional parenting/nurturing practices
- Cultural teachings/worldviews
- Family structure – elder caregivers, extended family
- American Indian life skills development
- Lesson Modules – illustrative designs, scenarios, activities
- Community resources - tribal programs, IHS
- Native American population vs. general population



Johns Hopkins Center for
American Indian Health



How Well Has Family Spirit Worked?



Family Spirit Impact: Pregnancy to Age 3

Parenting

- Increased maternal knowledge ^{1,2,3,4}
- Increased parent self-efficacy ^{3,4}
- Reduced parent stress ^{2,4}
- Improved home safety attitudes³

Mothers' Outcomes

- Decreased depression. ^{1,2,4}
- Decreased substance use ⁴
- Fewer risky behaviors ^{3,4}



Child Outcomes

- Fewer social, emotional and behavior problems through age 3. – Decreased Externalizing, Internalizing and Dysregulation. ^{2, 3, 4}
- Lower clinical risk of behavior problems over life course ⁴

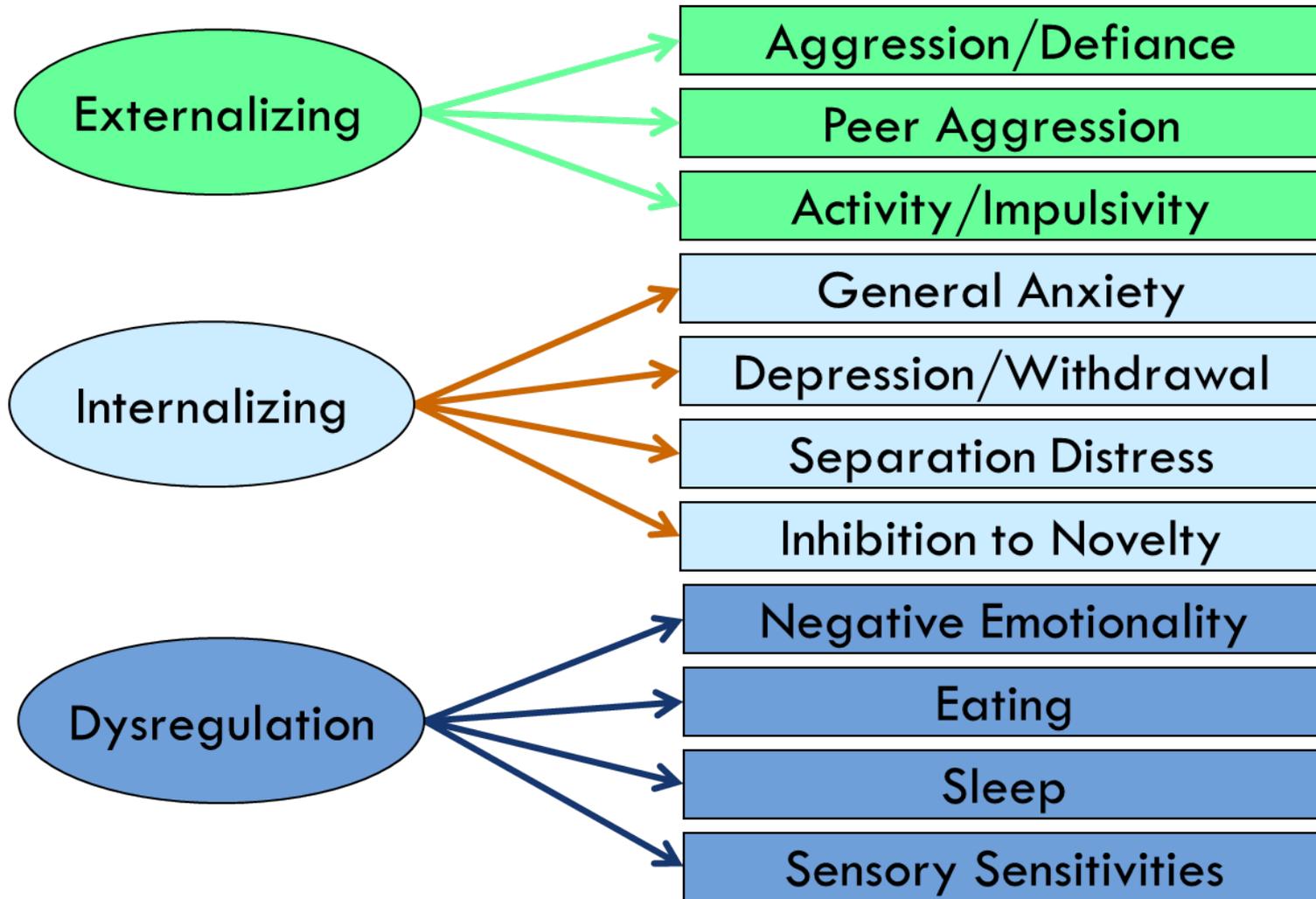
1 Barlow A, Varipatis-Baker E, Speakman K, et al Arch Pediatr Adolesc Med. 2006;160:1101-1107

2 Walkup J, Barlow A, Mullany B, et al. Journal of the American Academy of Child and Adolescent Psychiatry. June 2009.

3 Barlow A, Mullany B, Neault N, et al. American Journal of Psychiatry. January 2013.

4 Barlow A, Mullany B, Neault N, et al. American Journal of Psychiatry., February 2015.

ITSEA Problem Domains and Subscales within Domains



Parenting and Early Childhood Behavior Problems Associated with Obesity



- Negative parenting (inconsistent discipline; restrictive, coercive parenting) associated with increased obesity risk in children.
 - *Int J Obes (Lond)*. 2006 Dec;30(12):1766-74.
 - *Trends Endocrinol Metab*. 2013 Apr 19 E-pub
- Externalizing behaviors at 24 mos associated with higher BMI at 24 months and thru age 12
 - *BMC Pediatr*. 2010 Jul 14;10:49
- Obese children have higher rates of externalizing and internalizing disorders.
 - *Acad Pediatr*. 2013 Jan-Feb;13(1):6-13



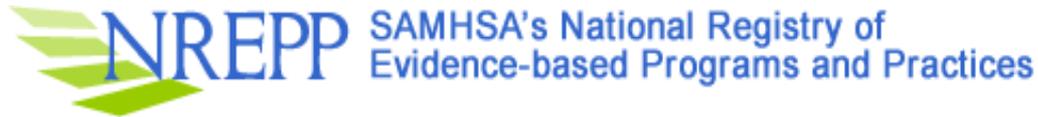
Family Spirit: Ready to Scale



Highest **participant retention**:
91% to 1 year postpartum; 83% to
3 years postpartum

4.0/4.0 on “**Readiness for
Dissemination**”

Highest **federal rating** for
HomeVEE: effectiveness of home
visiting program models targeting
families with children 0 to 5



Current National Reach



Replication Phases



PLANNING

- Introductory Webinar
- Readiness/Evaluation Tools
- Distribution of Curriculum to Trainees
- Online Knowledge Assessments
- Pre-Training Calls

TRAINING

- Rigorous Week-Long Training
- Focus on Curriculum Content/Delivery
- Evaluation Training
- FS Certification

IMPLEMENTATION

- Post-Training / Implementation Calls
- Quarterly Check-Ins
- FS Connect Opportunities
- * Option to help with evaluation.



What's Next for Family Spirit?



Current IHS Partnership

- Contract between Indian Health Service Community Health Representative Program (HQ) and Johns Hopkins Center for American Indian Health (Oct 2013 – Sept 2015)
 - Train 6 Indian Health Service Community Health Representative Programs to implement Family Spirit Program
- Recent interest from SDPI tribal program to implement Family Spirit to address risk factors, including those for obesity



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