The BLUES Project:
Targeting Social Determinants of Health to Address the City's High Infant Death Rate

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Presentation Overview

- History of the BLUES Project

- Overview of infant mortality in Tennessee

- The BLUES Project intervention

- Outcomes of the BLUES Project in Shelby County

- Future directions and program expansion

The BLUES Project

- **The Blues Project (BLUES) is a c**ollaborative effort with researchers at the University of Tennessee Health Science Center and BlueCross BlueShield of Tennessee to impact the high infant mortality rate in Memphis, TN.

- Designed initially to be clinic/site-based alternative to Nurse Home Visitation Programs.

- Since 2005, the BLUES model has matured to be an evidence-based, holistic approach to delivery of health services and for addressing health disparities.

- Our goal is to help families have full term, healthy babies, assist parents in developing their own support systems, and empower mothers AND fathers to set and achieve attainable life goals.

- BLUES address health, social, behavioral and environmental risk factors for infant mortality, maternal and child health outcomes.
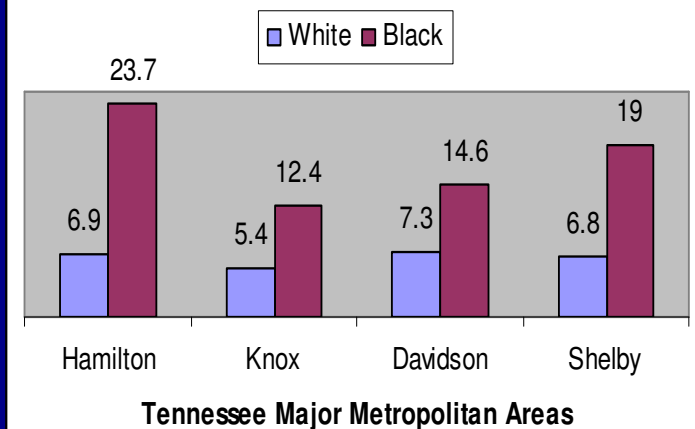
Infant Mortality - Tennessee

- The infant mortality rate (IMR) is the number of deaths of infants under one year of age per 1,000 live births in a given population.

- IMR is used to compare the health and well-being of populations across and within countries.

- In 2006, Tennessee's IMR was ranked 45th in the nation (8.7 per 1,000 live births), with only five states having higher infant death rates.

- In 2006, the black infant death rate (16.8 per 1, 000 live births) was 2.5 times the rate for white babies (6.6 per 1,000 live births)

- In 2007, 718 babies born in Tennessee died before their first birthdays.

*Source: Tennessee Department of Health; Infant Mortality in Tennessee: 1997-2006.

Infant Mortality – TN Counties

- In 2004, Memphis, Tennessee ranked 1st nationally with a rate of 12.8 overall and an alarming 17.4 for Black infants.

- In 2006, Shelby County, TN ranked 1st in the state with an overall infant mortality rate of 13.8 per 1,000 live births.

- Hamilton County, TN had the 2nd highest IMR (11.2 per 1,000 live births) compared to other metropolitan areas in Tennessee and the highest Black IMR (23.7 per 1,000 births).

- 2008 data show a significant IMR decrease from 2006 for both Shelby County (12.3) and Hamilton County (9.7)

Tennessee Metro Comparison of Infant Mortality Rates by Race, 2006

□ White ■ Black

	Hamilton	Knox	Davidson	Shelby
White	6.9	5.4	7.3	6.8
Black	23.7	12.4	14.6	19

Tennessee Major Metropolitan Areas

Infant Mortality – Risk Factors

- Prematurity (<37 weeks gestation) and Low birth weight (LBW<2500 grams) are major causes of infant mortality (IM)[1].

- IM strongly associated with various maternal socioeconomic, environmental and behavioral risk factors[2,3].

- Poverty

- Minority race/ethnicity

- Low parental education

- Single parent households

[1]Abel MH, Low birth weight and interactions between traditional risk factors. The Journal of Genetic Psychology, 2001. 158(4): p. 443-456.
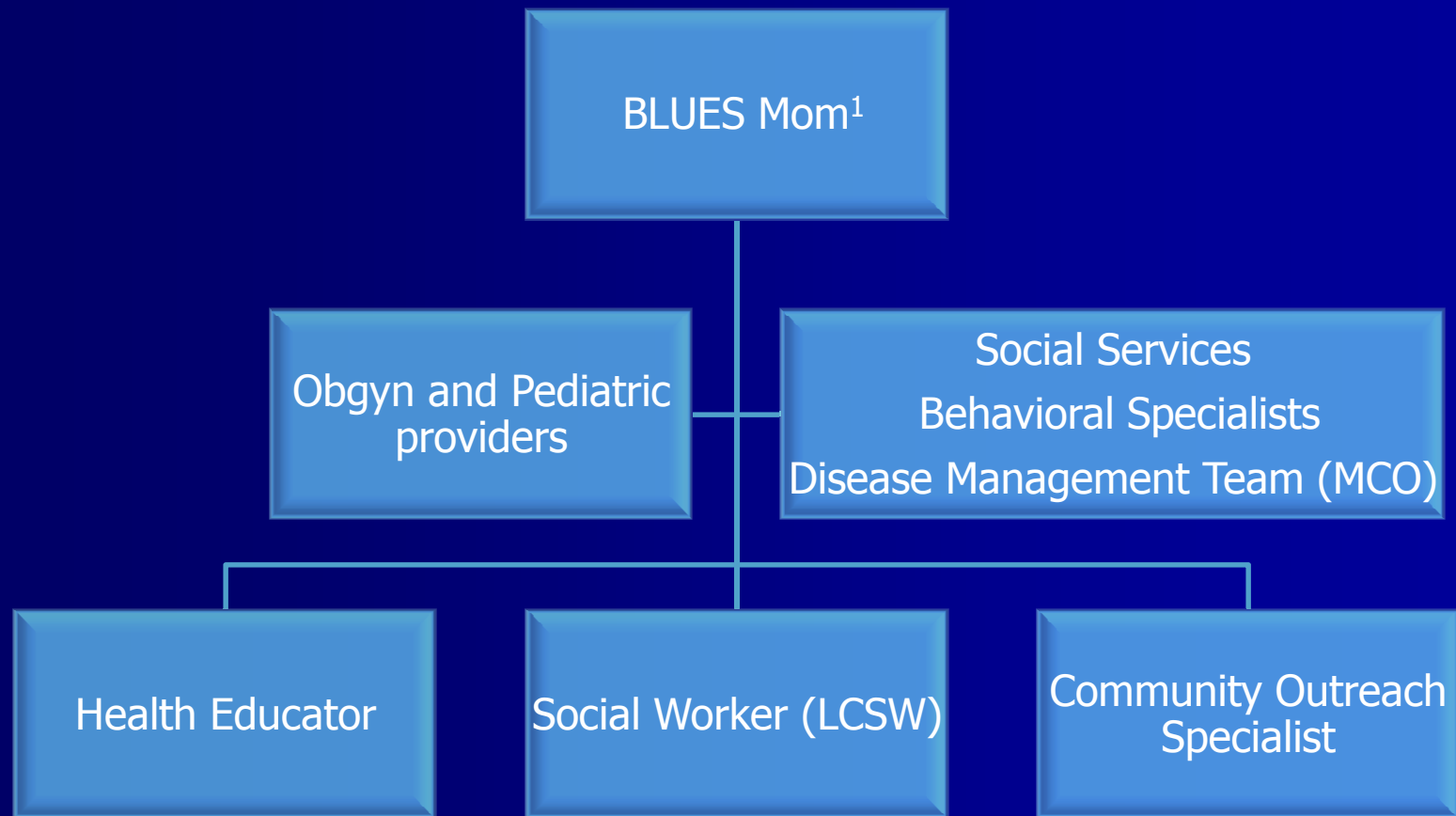
[2]Leslie, J.C., et al., Infant mortality, low birth weight, and prematurity among Hispanic, white, and African American women in North Carolina. Am J Obstet Gynecol, 2003. 188(5): p. 1238-40.

[3]Cramer, J.C., Social factors and infant mortality: identifying high-risk groups and proximate causes. Demography, 1987. 24(3): p. 299-322.

The BLUES Intervention

- **The BLUES Model is 3-fold :**
    - Health
    - Social Support
    - Community Outreach

- **BLUES** offers:
    1. Immediate access to prenatal and continued care for mom and baby for the insured and uninsured.
    2. Prenatal and Postnatal education
    3. Individualized case management
    4. Support and Empowerment
    5. Family planning (BIRTH SPACING)
    6. Information to help moms and dads continue their education and secure employment
    7. Referrals to community resources and services

The BLUES Team Approach

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                    ┌─────────────────┐
                    │   BLUES Mom[1]   │
                    └─────────────────┘
                            │
        ┌───────────────────┴───────────────────────┐
┌──────────────────┐              ┌────────────────────────────────┐
│ Obgyn and Pediatric │          │       Social Services          │
│    providers     │              │    Behavioral Specialists      │
└──────────────────┘              │ Disease Management Team (MCO)  │
                                  └────────────────────────────────┘
        ┌───────────────────┬───────────────────────┐
┌──────────────┐   ┌──────────────────┐   ┌──────────────────────┐
│Health Educator│   │Social Worker (LCSW)│  │ Community Outreach  │
│              │   │                  │   │     Specialist       │
└──────────────┘   └──────────────────┘   └──────────────────────┘
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[1]Eligibility: Less than 29 weeks gestation and volunteer to receive prenatal, post-partum follow-up, and pediatric care at participating BLUES clinics.

The BLUES Process

- Attend at least 1 monthly clinic-based, psycho-educational group session; and/or meet individually with clinic BLUES team member.

- 36 session curriculum
  - 10 prenatal
  - 25 post partum
  - Pre/Post Knowledge test
  - Exit interview
  - All sessions include topics on goal setting, contraception, birth spacing, education, and employment

- Receive at least 1 monthly phone contact from Community Outreach Staff
  - Case management
  - Identify resources and maintain referrals
  - Conduct follow-up

HEALTH CARE

FOLLOW-UP

COUNSELING

MOM

SOCIAL SUPPORT

REFERRAL
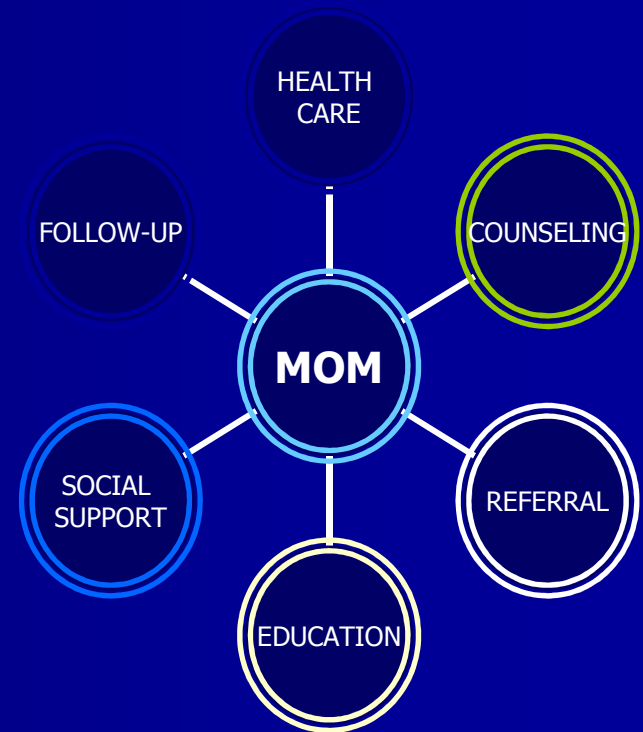
EDUCATION

BLUES: Evidence-Based Research

- 4-year, prospective cohort study (2005-2009)

- Sample
  - 1,071 mothers recruited at 4 community health clinics
  - 96% African American mothers
  - Single, adult, less than high school education
  - 100% Medicaid eligible
  - Retention = 84% (900 deliveries)
  - Completion = 65% (exit)
  - 18% (162) active study participants

- Outcome Measures included:
  1. Birth Outcomes
  2. Social/Behavioral Outcomes
  3. Cost Effectiveness

BLUES - Birth Outcome Measures

- **Primary Measures**
  - Low Birth Weight (<2500 grams or 5 lbs 8 ounces)
  - Prematurity (<37 weeks gestation)
  - Infant Mortality (deaths/1,000 live births in the 1st year of life)

- **Compare BLUES outcomes to Control births**
  - Controls were women receiving prenatal care at participating BLUES community health clinics
  - <29 weeks gestation at onset of prenatal care
  - delivering a live baby during 2005-2007
  - Controls did not receive the BLUES Project Intervention.

BLUES – Social/Behavioral Outcome Measures

- Primary Measures
  - Change in socio-demographic characteristics from baseline to 24 months post partum (education and employment status)

- Assessment, diagnosis, treatment and follow-up
  - 50-item Psycho-social screening assessment at baseline, 6- weeks post partum, and 24 months post partum
    - Stress
    - Depression
    - Domestic violence
    - Substance abuse
    - Social support
    - Education and employment

BLUES – Cost Effectiveness Measures

- Medical - (heath care cost and return on investment)

- Individual - (overall benefit to mothers)

- Family - (overall benefit to families)

- Community - (overall benefit to county/state)

BLUES - Demographics

Demographics	BLUES[1] (n=824)		Controls[2] (n=758)			
	Mean	SD	Mean	SD	t	p-value
Mother Age (years)	22.5	5.14	22.8	5.14	.79	.4312
Onset of prenatal care (wks)	12.08	5.69	25.16	6.54	2.15	.0322
	N	%	N	%	χ^2	p-value
Teen (<20 years)	272	33	227	30	.2962	.5863
Single Mother	824	100	758	100	-	-
Education (<high school)	453	55	462	61	1.7617	.1844
Unemployed	552	67	478	63	.8454	.3579
African American	791	96	743	98	.8311	.3619
STD	181	22	30	4	32.4236	<.0001
Substance Abuse	280	34	174	23	7.8318	.0051
Parity	428	52	349	46	1.6409	.2002

[1]Demographics at baseline / initial program exposure from both maternal self-report and patient medical record
[2]Demographics at onset of prenatal care identified from patient medical record

BLUES - BIRTH OUTCOMES

Table 1: Prevalence of Low Birth Weight, Prematurity, and Infant Death in BLUES and Control groups

	BLUES (n = 824) n (%)	Controls[1] (n = 758) n (%)	*Sig.*
LBW[2]	81 (9.81)	141 (18.60)	0.0008
Prematurity[3]	72 (8.72)	150 (19.77)	0.0001
Infant deaths	2 (0.24)	24 (3.10)	0.0001

[1]Randomly selected cohort of control births from the same clinics (2005-2007);
Control cases were selected from clinic patient records based on the variables gestational age at 1st prenatal visit (<29 wks), calculated using the first day of the last menstrual period (LMP), and date of delivery.

[2]LBW = birth weight < 2500 grams

[3]Prematurity = < 37 weeks gestation

BLUES - BIRTH OUTCOMES

Table 2: Pregnancy and delivery outcomes in BLUES and Control groups

	BLUES (n = 824)	Controls[1] (n = 758)	*Sig.*
Neonatal days hospital stay Mean (SD)	3.05 (5.42)	8.55 (8.80)	0.0002
Repeat STD/Infections during pregnancy n (%)	205 (24.93%)	482 (63.57%)	<0.0001
Substance abuse during pregnancy n (%)	77 (9.36%)	168 (22.18%)	<0.0001

[1]a cohort of control births from the same clinics (2005-2007); Control cases were selected from clinic patient records based on the variables gestational age at 1st prenatal visit (<29 wks), calculated using the first day of the last menstrual period (LMP), and date of delivery.

BLUES
Predictors of poor birth outcomes

Predictors   **Outcomes**

Late onset prenatal care (≥25 wks)
Lack of social support
Maternal distress
Domestic violence   ⟶   Lower birth weights
Undiagnosed mental illness   Shorter gestation
Maternal depression
Unemployment

Early onset prenatal care (<25 wks) ⟶   Higher birth weights
Prenatal contact with BLUES team (≥10)   Longer gestation

BLUES
SOCIAL / BEHAVIORAL OUTCOMES

Table 3: Socio-demographic status change in BLUES mothers from baseline[1] to 24-months postpartum (N=535) [2]

	Socio-demographic Status		Percent Change	Sig.
	Baseline[1]	24-months Postpartum		
	n (%)	n (%)		
Employment				
Unemployment	355 (66)	128 (24)	**-64%**	**<0.0001**
Education				
< High school	251 (47)	188 (35)	**-26%**	**<0.0001**
High school or GED	175 (33)	260 (49)	**+48%**	**<0.0001**
Some college	65 (12)	77 (14)	+17%	0.2796
College graduate	8 (1)	10 (2)	+100%	0.6345

[1]Baseline = initial program exposure
[2]18% of enrolled participants are actively receiving the BLUES Project intervention

BLUES
Social / Behavioral Outcomes

Table 4: Psycho-social change in BLUES mothers from baseline[1] to 24-months postpartum (N=535) [2]

Psychosocial risk (Yes or No)	n (%)		% Change	Sig.
	Baseline[1]	Postpartum		
Overall risk	529 (98.9)	530 (99.1)	+0.20	.3100
Stress	165 (30.8)	167 (31.3)	+2	.3600
Social support	353 (65.9)	509 (95.2)	+44	<.0100
Mental health	351 (65.7)	509 (95.1)	+45	<.0100
Depression	232 (43.3)	416 (77.81)	+80	.0300
Substance abuse	167 (31.3)	83 (15.5)	-50	<.0100
Domestic Violence	98 (18.3)	42 (7.9)	-57	<.0100

[1]Baseline = initial program exposure
[2]18% of enrolled participants are actively receiving the BLUES II intervention

Cost Effectiveness - Medical

- ✓ BLUES moms and babies experienced shorter hospital and neonatal days stay compared to controls

- ✓ This added up to a savings of more than 1,467 hospital days and a total savings of $17 million for 824 mothers

- ✓ BLUES costs appr. $2,400 per mom over 3 years.

- ✓ For every dollar invested in BLUES, there is $8.50 returned.

BLUES (N=824)

	Deliveries	Neonatal Days	Avg. cost	Cost/ delivery	Total cost
Preterm/ lbw	81	3.05	$15,100	$46,055	$3,730,455
Uncomplicated	743	2.32	$600	$1,398	$1,038,714
TOTAL COST			**$4,769,169**		

Controls (N=758)

	Deliveries	Neonatal Days	Avg. cost	Cost/ delivery	Total cost
Preterm/ lbw	159	8.55	$15,100	$129,105	$20,527,695
Uncomplicated	599	3.47	$600	$2,088.00	$1,250,712
TOTAL COST			**$21,778,407**		

Cost Effectiveness - Individual

1. Healthy, uncomplicated pregnancy and delivery
2. Increased social support
3. Increased screening, diagnosis, referrals, and treatment for mental and/or behavioral health services
4. Increased empowerment and self-sufficiency
5. Healthier mothers – (physically, mentally, and emotionally)

Cost Effectiveness - Family

- There are lifelong consequences for families and communities resulting from preterm and low birth weight deliveries and infant mortality.

- Several social factors associated with poverty are also related to poor child health, specifically low parental education, minority race/ethnic status, and single-parent household

BLUES

→ -Few preterm and/or low birth weight deliveries

-99.8% infant survival rate from birth through the 2nd year of life.
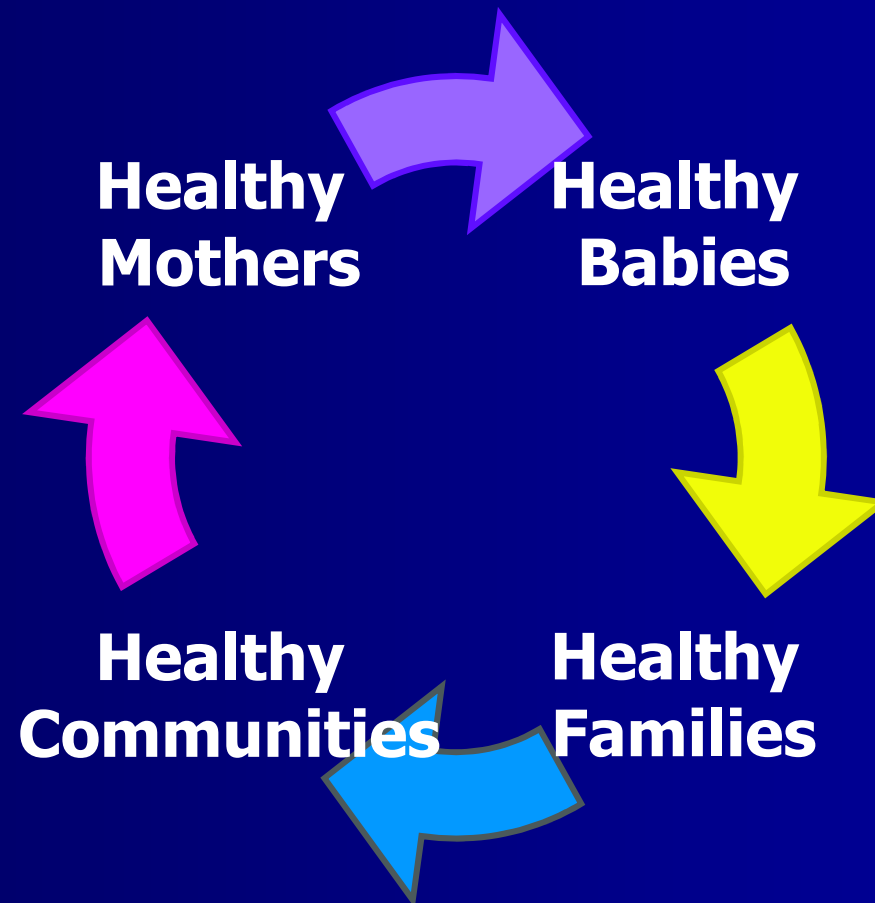
-90% compliance with on-time EPSDT/immunizations

→ -High education attainment

-Increased employment rates

→ -Normal, happy, healthy infants whose parents are contributing members of their communities

Cost Effectiveness - Community

Future Directions For the BLUES Project

- $1.7 million grant from BCBS Tennessee Health Foundation

- Expand services in Shelby County, TN and to Hamilton County, TN

- BLUES Project (Phase III) purposes to:
  - (1) demonstrate the scalability of the program and work to build a self-sustained structure of care that will expand, not only in the state of Tennessee, but across the country in cities with similar demographics/health outcomes to Memphis

  - (2) duplicate the BLUES model to prove the effectiveness of intervention for decreasing infant mortality risks (prematurity and low birth weight);

  - (3) compare the birth and child health outcomes of the Hamilton County participants to those in Shelby County, and

  - (4) establish the Blues Project as an effective, data-driven and cost-efficient model for reducing the health disparity of infant mortality in Tennessee.

Future Directions For the BLUES Project

Expansion of BLUES to Hamilton County, TN

	Hamilton County	The BLUES Project	Expected Outcomes
Prematurity	16.00%	8.43%	(-7.57%)
Low Birth Weight	18.60%	10.50%	(-8.10%)
Infant Mortality	11.2% (23.7% AA)	0.26%	(-10.94% AA)

• Pilot BLUES for 500 pregnant women in Hamilton County, TN

• Four zip codes with the highest rate of preterm births/infant deaths in Hamilton County were identified (37410, 37408, 37406, and 37403). Will target health clinics offering both Ob/Gyn and Pediatric care services in each zip code.

• Control sample will be recruited from the same participating community health clinics.

Summary

- The BLUES Project serves a large number of women and is the result of widespread community collaboration.

- Over 1,000 at-risk mothers have been served by the BLUES Project since its inception in 2005.

- Overall, BLUES is proving to be an effective model for reducing infant mortality, premature delivery and low birth weight, particularly for African American infants.

Conclusions

- BLUES demonstrates the impact that social support can yield; not only in terms of birth outcomes, but overall health and quality of life for at-risk mothers.

- The BLUES model is holistic in scope compared to other programs and empowers women to overcome social and economic barriers adversely affecting their health and that of their children.

- We can conclude that this cost-effective, collaborative approach to health care holds promise for improving the health and social outcomes of our mothers, children, families, and communities.

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