Food Insecurity and the Efficacy of a Gestational Diabetes (GDM) Risk Reduction Intervention: Healthy Eating Outcomes among American Indian and Alaska Native (AI/AN) Female Adolescents and Young Adults (FAYAs)

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Background

- American Indian and Alaska Native (AI/AN) women are unduly impacted by gestational diabetes mellitus (GDM) and food insecurity.
- GDM can cause severe perinatal complications for both mother and baby, and AI/AN women are disproportionately impacted by GDM, being twice as likely to have GDM and subsequent diagnosis of T2D than non-Hispanic White females.
- There are barriers to healthful eating in many AI/AN communities.
- AI/AN peoples have higher rates of food insecurity when compared to non-AI/ANs and are more likely to live in food deserts than any other racial/ethnic group.
- Living in a food insecure household during preconception and pregnancy may increase risk of greater weight gain.

Objective Statement and Conceptual Framework

- This secondary analysis used Stopping GDM Trial data to describe and explore food insecurity as a moderator of the efficacy of a GDM risk reduction intervention on healthy eating behaviors and self-efficacy at 3 months among AI/AN female adolescents and young adults (FAYAs).
- The study's conceptual framework embeds Laraia's Conceptual Framework of the Influence of Food Security Status on Gestational Weight Gain and Pregnancy Complications within Multilevel Influences on Health Behavior.



Methods

Research Design:

- This was a secondary analysis of existing internal, de-identified data from the parent study, the Stopping GDM Trial
- Stopping GDM Trial was a randomized controlled trial (RCT) with randomized assignment to either intervention arm or control arm via a minimization algorithm at each study site considering the FAYA's age and sexual activity status at study entry at the dyad level
- Stopping GDM intervention was a pre-conception, educational/behavioral intervention targeting the reduction of modifiable GDM risk factors
- Assessments for the RCT were up to 9-months follow-up, but for this investigation limited

Participants:

- The sample included 149 dyads of AI/AN FAYAs and their mothers (or adult female caregiver). • Eligibility Criteria for FAYAs:
- Age \geq 18 years, being AI/AN

Measurement:

- Food Insecurity
- Healthy Eating Self-efficacy For this investigation FAYAs completed the 5-item healthy eating subscale was used with 10-point Likert-type scaling (summation score range 5-50); higher scores indicate greater self-efficacy to eat healthfully (Cronbach's $\alpha = 0.96$ and .74 in the current sample)

Data Collection:

Statistical Analysis:

- Descriptive statistics

- Age from 12 to 24 years, being AI/AN, being at risk for GDM
- Eligibility criteria for mother / adult female caregiver:

Modified version of the validated USDA Household Food Security Survey Module: 6-item Short Form based on self-reported household food security; households with scores 0-1 are described as food secure, while households with scores 2-4 ("low food security") and 5-6 ("very low food security") together comprise households considered "food insecure;" for our modified version of this scale, scores were dichotomized as 0-1 indicating food security and scores 2-6 indicated food insecurity; mothers completed this survey at baseline

• Healthy Eating Behavior

For this investigation FAYA completed the 9-items from healthy eating scale from the CDC Youth Risk Behavior Surveillance System, including the 4-item vegetables subscale (sum of items 3 through 6); items are Likert scaled ranging from 0 to 6, except item 9 regarding the frequency of breakfast (ranges 0 to 7); higher scores indicate more healthy eating behavior

• Sociodemographic characteristics for FAYA and mother

• Assessments at the pre-intervention at the baseline visit and at 3-month follow-up (FU) via online secure web portal in the clinical setting.

 Exploratory data analysis Group comparative analyses Linear mixed modeling Intention to treat analyses of the effect of the Stopping GDM intervention Moderation Analyses

Results

Table 1. C

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	Full Sample (N=149)			Dyad Members Cohabitating (n=95)					
	Total	Intervention	Control		Total	Interventio	Control		
	(N=149)	(n=79)	(n=70)		(n=95)	n (n=57)	(n=38)		
	Mean±SD	Mean±SD	Mean±SD or		Mean±SD	Mean±SD	Mean±SD		
	or n (%)	or n (%)	n (%)	p-value	or n (%)	or n (%)	or n (%)	p-value	
Daughter's Characteristics									
	16.7±3.0	16.3±2.7	17.2±3.3	.093	16.3±2.9	15.9±2.7	16.8±3.1	.180	
ified)				.725ª				.606ª	
า	118 (79.2)	60 (75.9)	58 (82.9)		72 (75.8)	40 (70.2)	32 (84.2)		
ainment				.473				.933	
	105 (70.5)	59 (74.7)	46 (65.7)		74 (77.9)	45 (78.9)	29 (76.3)		
ED	21 (14.1)	9 (11.4)	12 (17.1)		10 (10.5)	6 (10.5)	4 (10.5)		
	23 (15.4)	11 (13.9)	12 (17.1)		11 (11.6)	6 (10.5)	5 (13.2)		
atus				.714				1.000	
	41 (27.7)	23 (29.5)	18 (25.7)		27 (28.7)	16 (28.6)	11 (28.9)		
	107 (72.3)	55 (70.5)	52 (74.3)		67 (71.3)	40 (71.4)	27 (71.1)		
		Mother	's Character	ristics					
	44.1±9.3	43.3±8.4	45.1±10.2	.242	43.8±7.1	42.8±6.3	45.3±8.0	.089	
ainment				.086				.205ª	
	5 (3.4)	3 (3.8)	2 (2.9)		3 (3.2)	2 (3.5)	1 (2.6)		
ED	20 (13.4)	6 (7.6)	14 (20.0)		11 (11.6)	4 (7.0)	7 (18.4)		
	124 (83.2)	70 (88.6)	54 (77.1)		81 (85.3)	51 (89.5)	30 (78.9)		
	/			.067				.831	
iting	87 (58.4)	52 (65.8)	35 (50.0)		59 (62.1)	36 (63.2)	23 (60.5)		
	62 (41.6)	27 (34.2)	35 (50.0)		36 (37.9)	21 (36.8)	15 (39.5)		
				.157		_ (()))		.442	
	103 (69.6)	59 (74.7)	44 (63.8)		75 (78.9)	47 (82.5)	28 (78.9)		
	45 (30.4)	20 (25.3)	25 (36.2)		20 (21.1)	10 (17.5)	10 (26.3)		
d Securitv				1.000				.827	
	91 (61.9)	48 (62.3)	43 (61.4)		62 (65.3)	38 (66.7)	24 (63.2)		
	56 (38 1)	29(377)	27 (38.6)		33 (34 7)	19 (33 3)	14 (36 8)		
		Daugh	ter's Outco	mes ^b		10 (0010)	11 (0010)		
r Healthv				.878				.311	
Fating	29 7+9 6	29 8+9 8	29 6+9 5		31 1+9	32 9+9 1	29 9+9 7		
	2011 2010	_0.01010	_0.0_0.0		0111201	02.020.1	_0.0_0.1		
Behavior:				958				830	
	5 5+1 5	5 5+3 9	5 5+4 2		5 5+4 0	5 4+3 7	56+45		
	0.011.0	0.010.0	0.0112		0.011.0	0.120.1	0.011.0		









Table 2. Association of Household Food Security with Diabetes-Nutrition Related Constructs at Baseline

	Full Sample (N=148)			Dyad Members Cohabitating (n				า=95)	
	Food Secur	ty			Food Securit	ty			
	Secure	Insecure	Total		Secure	Insecure	Total		
Outcome ^a	Mean±SD	Mean±SD	Mean±SD	p-value	Mean±SD	Mean±SD	Mean±SD	p-value	
Self-Efficacy for Healthy Living									
Healthy Eating	30.3±10.0	29.0±8.8	29.8±9.6	.436	31.8±9.5	29.7±9.1	31.1±9.3	.307	
Subscale									
Eat 3 meals a day	7 1+3 2	67+28	69+30	476	7 4+3 1	6 6+2 9	7 1+3 0	175	
Limit snacking in	54+29	5 2+2 8	5 3+2 8	741	5 9+3 0	5 2+2 9	5 6+2 9	316	
	0.412.0	0.212.0	0.012.0		0.010.0	0.212.0	0.012.0		
between meals (item									
2)									
Drink water most of	7.3±2.8	7.4±2.6	7.3±2.7	.883	7.3±2.7	7.8±2.5	7.5±2.6	.369	
the time (Item 3)									
Avoid junk food and	4.5±2.6	4.3±2.1	4.4±2.4	.580	5.1±2.8	4.4±2.3	4.8±2.6	.262	
fast food (Item 4)									
Avoid drinking sugar-	6.0±2.9	5.4±2.4	5.8±2.7	.239	6.0±2.7	5.7±2.6	5.9±2.7	.617	
sweetened heverages									
such as soua, juice,									
and energy drinks									
(Item 8)									
Healthy Eating Behavio	ors								
Times eating	5.0±3.9	6.3±4.1	5.5±4.0	.057	4.6±3.6	7.0±4.4	5.5±4.0	.006	
vegetables subscale									
(Sum of items 3-6)									
Times drinking 100%	1.4+1.5	1.6+1.5	1.4+1.5	.449	1.6+1.6	1.7+1.6	1.6+1.6	.662	
fruit iuico such as		1102110			1102110		1.021.0		
orange, apple, or									
grape juice (Item 1)									
Times eating fruit	1.8±1.4	2.4±1.8	2.0±1.6	.077	1.7±1.2	2.7±1.8	2.0±1.5	.007	
(Item 2)									
Times drinking a can,	1.5±1.3	1.6±1.4	1.5±1.4	.704	1.5±1.3	1.5±1.5	1.5±1.4	.872	
bottle, or glass of									
soda or pop (Item 7)									
Glasses of milk drank	1 2+1 4	1 3+1 4	1 2+1 4	701	13+15	1 3+1 4	1 3+1 5	892	
	1.211.4	1.011.4	1.2±1.4	.701	1.511.5	1.011.4	1.5±1.5	.032	
(item 8)	4 4 1 0 4	2.0+0.4	4.010.0	757	2.010.4	0.7.0.0	2.010.0	007	
Days eating breakfast	4.1±2.4	3.9±2.1	4.0±2.3	./5/	3.9±2.4	3.7±2.2	3.9±2.3	.627	
(Item 9)									

able 3. Selected Plots (Cohabiting Dyad Members, n=95)



able 4. Effect of Baseline Food Insecurity with Change in Diabetes-Nutrition Related constructs by Group Assignment (Cohabiting Dyad Members, n=95)





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Discussion

- At baseline:
 - Food insecurity was fairly prevalent with more than a third identifying as food insecure.
 - Food insecurity was associated with higher levels of eating vegetables and fruit for the full sample (p=.045) and cohabitating dyads (p=.002).
- Regarding the intervention effects:
 - By the 3-month follow-up, healthy eating self-efficacy (p=.048) and limiting snacking between meals (p=.031) improved more in the control group than in the intervention group but only for cohabitating dyads.
- In the full sample, the intervention group had increases in times eating vegetables (p=.022) and fruit (p=.015), while the control group had declines.
- Regarding food insecurity as a treatment modifier:
- In the full sample food insecurity did not moderate the group by time interaction for self-efficacy for healthy eating ($p \ge .05$) but did moderate the group by time interaction for the eating behaviors of times drinking soda (p=.004) and days eating breakfast (p=.013).
- For cohabiting dyads food insecurity did moderate self-efficacy for eating 3 meals a day (p=.024) and days eating breakfast (p=.012).

Limitations

- Need to dichotomize food security scores due to error in wording of a question, resulting in a loss of information on the severity of food insecurity
- No systematic way to know if the daughters and mothers in the full sample lived together, except for a subsample
- None of the measures for this investigation were validated for AI/AN audiences
- Longitudinal follow-up was limited due problems with recruitment in the parent study

Conclusion, Implications and Next Steps

- These results suggest food insecurity is an important factor regarding the efficacy of interventions designed to reduce GDM risk and offer unique insight on 'upstream causes' of GDM health disparities among AI/AN communities.
- Given the intergenerational implications of GDM, it is prudent that public health and health care organizations work with AI/AN communities to support healthful eating environments and practices among AI/AN AYAs.
- Next steps include replication of the study to address the identified methodologic limitations.

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