Psychosocial profiles moderate the association between pre-pregnancy BMI and gestational weight gain among pregnant people of the Upper Midwest

Katherine Ziegler, MPH
Avera Research Institute, Sioux Falls, South Dakota, USA
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Background

Gestational weight gain is an important, modifiable factor influencing maternal and child health outcomes.

Discordant gestational weight gain, inadequate or excessive, increases the risk for adverse maternal and child health outcomes.

- Maternal: hypertensive disorders, labor and delivery complications, postpartum weight retention, and mood disorders.
- Newborn: preterm birth, small for gestational age or large for gestational age, poor long term metabolic health outcomes.

Gestational weight gain is a dynamic process influenced by physical, psychological, social, and environmental factors.

- Risk factors: pre-pregnancy BMI category, lower economic status, food insecurity, mood disorders, lower educational levels, primiparity, and attitude towards body and diet.

Study Objective and Population

Study Objective

- To identify psychosocial profiles in pregnancy and to investigate how these profiles may modify the relation between pre-pregnancy BMI and gestational weight gain in pregnant people of the Upper Midwest.

Study Population

- Utilized two South Dakota sites of the Environmental influences on Child Health Outcomes (ECHO) program
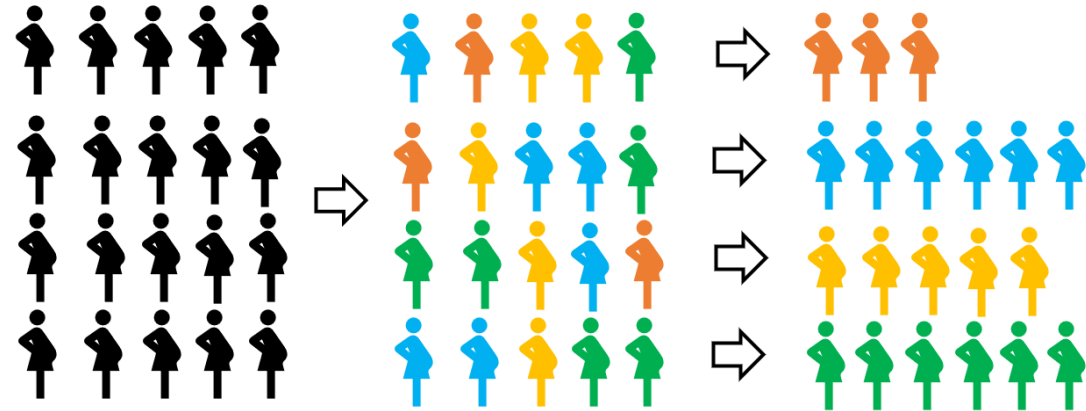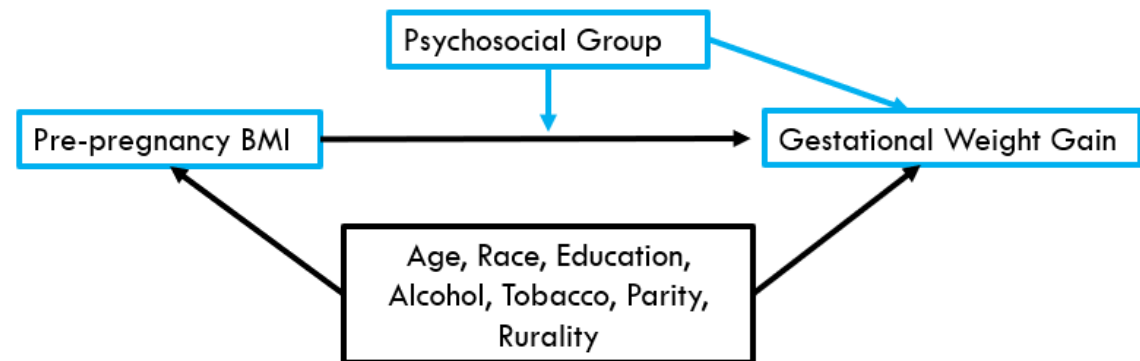- N=1045 pregnant people

Methods

Step 1: Development of psychosocial groups in the ECHO new pregnancy cohort.

- Based on participant self-reported survey instruments related to mental health and social support measures.
- Latent Class Analysis

Step 2: To investigate how these psychosocial groups may modify the relation between pre-pregnancy BMI and gestational weight gain.

- Hypothesis: Psychosocial group membership influences the relationship between pre-pregnancy BMI and gestational weight gain.
- Multinomial Logistic Regression

Psychosocial Group

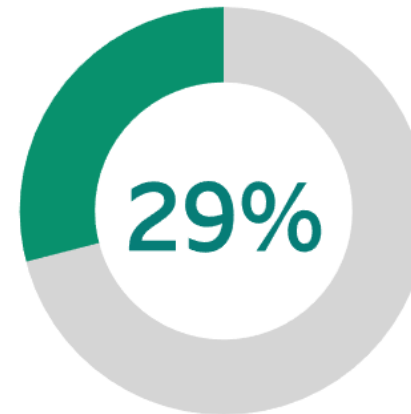Pre-pregnancy BMI → Gestational Weight Gain

Age, Race, Education, Alcohol, Tobacco, Parity, Rurality

Mental Health Measures

Among the n=1,045 pregnant people in our sample:
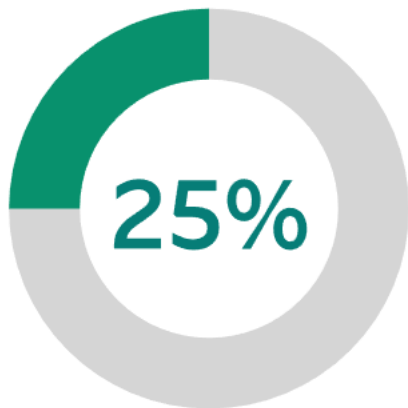
Perceived Stress

47%
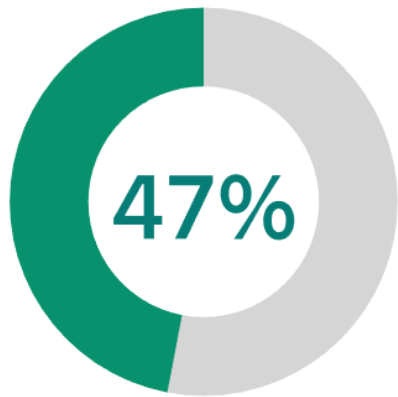
Just under half of pregnant people in our sample experienced moderate to high perceived stress in pregnancy.

State Anxiety

29%

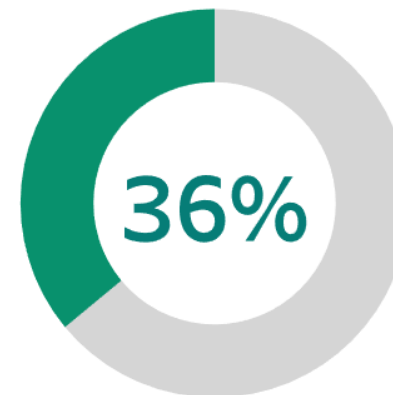**Twenty-nine percent** of pregnant people in our sample experienced current symptoms of anxiety at the time of survey during pregnancy.

Edinburgh Depression

25%

A **quarter** of pregnant people sampled screened positive for possible or probable depressive symptoms in pregnancy.

Trait Anxiety

36%

Thirty-six percent of pregnant people in our sample experienced symptoms of general anxiety during pregnancy.

Social Support Measures

Among the n=1,045 pregnant people in our sample:

Informational Support

62%
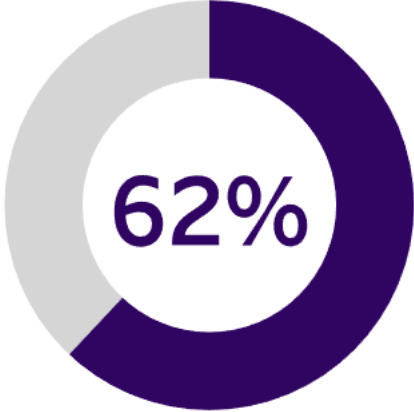
Over 60% of pregnant people in our sample scored as having high informational support.

Emotional Support

62%
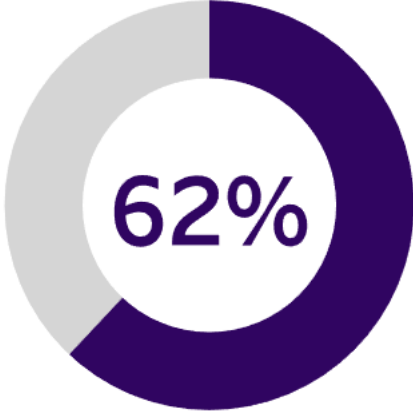
Sixty-two percent of all pregnant people in our sample reported high emotional support during pregnancy.

Instrumental Support

50%

Half of all pregnant people in our sample reported high instrumental support.

Results: Latent Class Analysis

Latent Class Analysis provided **four distinct psychosocial subgroups** within our sample of pregnant people.

Table 1. Descriptive Statistics

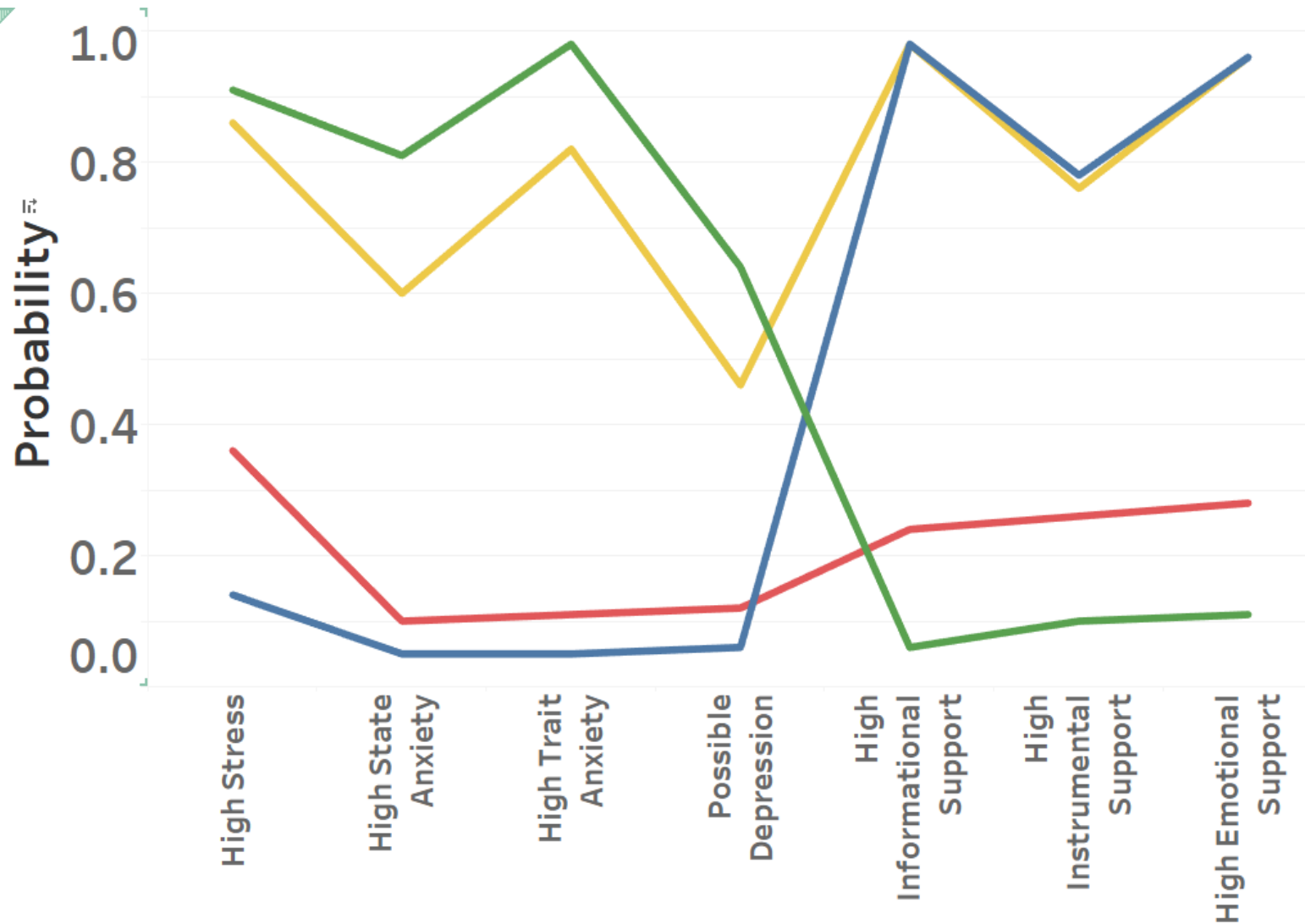| Maternal Characteristic	Total (n=1045)	Gestational Weight Gain		
		Inadequate (n=273)	Adequate (n=308)	Excessive (n=464)
Age	29.7 (4.6)	29.9 (4.6)	30.2 (4.4)	28.9 (4.6)
Race				
American Indian or Alaska Native	39 (3.7)	10 (3.7)	10 (3.3)	19 (4.1)
White	834 (79.8)	213 (78.0)	249 (80.8)	372 (80.2)
Some other race	51 (4.9)	15 (5.5)	14 (4.6)	22 (4.7)
Education				
Less than High School	27 (2.6)	6 (2.2)	9 (2.9)	12 (2.6)
High School or Higher	1005 (96.2)	266 (97.4)	295 (95.8)	444 (95.7)
Alcohol Use	50 (4.8)	17 (6.2)	14 (4.6)	19 (4.1)
Tobacco Use	47 (4.5)	14 (5.1)	11 (3.6)	22 (4.7)
Rural	366 (35.0)	90 (33.0)	101 (32.8)	175 (37.7)
Parity	1.2 (1.2)	1.3 (1.2)	1.4 (1.3)	1.1 (1.2)
Pre-Pregnancy BMI Categories				
Underweight	15 (1.4)	7 (2.6)	4 (1.3)	4 (0.9)
Normal Weight	414 (39.6)	123 (45.1)	172 (55.8)	119 (25.7)
Overweight	285 (27.3)	41 (15.0)	64 (20.8)	180 (38.8)
Obese	331 (31.7)	102 (37.4)	68 (22.1)	161 (34.7)
Psychosocial Groups				
Poor Mental Health, Low Social Support (1)	223 (21.3)	58 (21.3)	74 (24.0)	91 (19.6)
Poor Mental Health, High Social Support (4)	168 (16.1)	40 (14.7)	35 (11.4)	93 (20.0)
Good Mental Health, High Social Support (2)	448 (42.9)	114 (41.8)	132 (42.9)	202 (43.5)
Good Mental Health, Low Social Support (3)	206 (19.7)	61 (22.3)	67 (21.8)	78 (16.8)

- The majority identified as:
  - White (80%)
  - High school education or higher (96%)
  - Urban (65%)
  - No alcohol (95%) or tobacco (95%) in pregnancy
- Average age ~30 years

- The majority were categorized as normal weight based on pre-pregnancy BMI (39.6%) and had good mental health with high social support (42.9%).

Results: Multinomial Logistic Regression

Variable Effect	Wald Chi-Square	P-value
Psychosocial Group* Pre-pregnancy BMI Category	41.6862	**0.0012**
Age	6.9103	**0.0316**
Race	2.5333	0.6387
Alcohol Use	0.0904	0.9558
Tobacco Use	1.1104	0.5739
Rurality	2.2714	0.3212
Education	3.5681	0.1680
Parity	6.1848	**0.0454**

The joint effect of pre-pregnancy BMI category and psychosocial group was significantly associated with gestational weight gain while adjusting for covariates.

Compared to pregnant people with good mental health and high social support profiles and categorized as normal pre-pregnancy BMI:

- Pregnant people with:
  - a pre-pregnancy BMI of **overweight** and
    - **good mental health and low social support** (p<0.03) or
    - **poor mental health and high social support** (p=0.01)
  - a pre-pregnancy BMI of **obese** and
    - **poor mental health and high social support** (p<0.01)

  were more likely to have excessive weight gain.

- Pregnant people with:
  - a pre-pregnancy BMI of **obese** with **good mental health and low social support** (p<0.01)

  were more likely to have inadequate weight gain.

Conclusions

- Among pregnant people from an ECHO cohort in the Upper Midwest:
  - We observed moderate to high symptoms/indicators of stress (47%), anxiety (state=29%; trait=36%), and depression (25%).
  - We observed high social support, with 62% reporting both high informational and emotional support, and 50% reporting high instrumental support.
  - Four distinct psychosocial groups:
    - Poor Mental Health & Low Social Support
    - Poor Mental Health & High Social Support
    - Good Mental Health & Low Social Support
    - Good Mental Health & High Social Support
  - Psychosocial groups influence the relationship between pre-pregnancy BMI and gestational weight gain.
- Our findings suggest that psychosocial profiles moderate the association between pre-pregnancy BMI and gestational weight gain among pregnant people in the upper Midwest.
- These results support the importance of focusing on psychosocial factors, as well as pre-pregnancy BMI, when conceptualizing targeted interventions for achieving recommended gestational weight gain.

Thank you!

Ziegler KM, Holmes A, Hockett CW, McCormack L, Morales S, Elliott A. Psychosocial profiles moderate the association between pre-pregnancy BMI and gestational weight gain among pregnant people of the Upper Midwest.

Katherine.Ziegler@avera.org

Results

Variables (reference category)		GWG Group			
		Inadequate Weight Gain		Excessive Weight Gain	
		Coefficient	p-value	Coefficient	p-value
Intercept					
Age		-0.017	0.443	-0.063	0.001
Race (White)	American Indian/Alaska Native	0.015	0.977	-0.078	0.868
	Other racial group	0.248	0.542	-0.115	0.767
Alcohol (Alcohol Use=No)	Alcohol Use=Yes	0.225	0.583	0.066	0.869
Tobacco (Tobacco Use=No)	Tobacco Use=Yes	0.305	0.523	0.355	0.417
Rural (Urban)	Rural	-0.009	0.963	0.215	0.222
Psychosocial*Prepreg BMI	High Psychosocial Risk, Underweight	-13.059	0.983	-1.063	0.475
(Low Psychosocial Risk, Normal Weight)	High Psychosocial Risk, Overweight	-0.381	0.375	-0.029	0.935
	High Psychosocial Risk, Obese	0.257	0.414	0.224	0.443
	Low Social Support, Underweight	15.079	0.992	0.292	0.999
	Low Social Support, Overweight	-0.069	0.887	0.842	0.026
	Low Social Support, Obese	1.185	0.003	0.343	0.42
	High Mental Health, Underweight	-14.765	0.992	-15.2	0.989
	High Mental Health, Overweight	-0.052	0.92	1.007	0.012
	High Mental Health, Obese	1.081	0.123	1.931	0.002