

May 20th, 5:00 PM - 7:00 PM

# BMI, Gestational Weight Gain and Angiogenic Biomarker Profiles for Preeclampsia Risk

Tiffany A. Moore Simas  
*University of Massachusetts Medical School*

Sharon E. Maynard  
*George Washington University*

Xun Liao  
*University of Massachusetts Medical School*

Follow this and additional works at: [http://escholarship.umassmed.edu/cts\\_retreat](http://escholarship.umassmed.edu/cts_retreat)

 Part of the [Clinical Epidemiology Commons](#), and the [Obstetrics and Gynecology Commons](#)



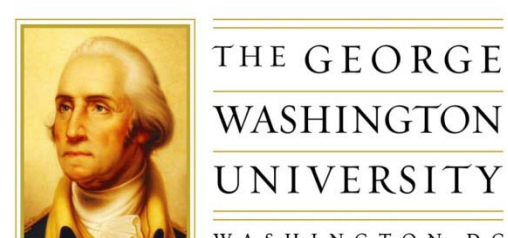
This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 3.0 License](#).

---

Moore Simas, Tiffany A.; Maynard, Sharon E.; and Liao, Xun, "BMI, Gestational Weight Gain and Angiogenic Biomarker Profiles for Preeclampsia Risk" (2011). *UMass Center for Clinical and Translational Science Research Retreat*. 11.  
[http://escholarship.umassmed.edu/cts\\_retreat/2011/posters/11](http://escholarship.umassmed.edu/cts_retreat/2011/posters/11)

This material is brought to you by eScholarship@UMMS. It has been accepted for inclusion in UMass Center for Clinical and Translational Science Research Retreat by an authorized administrator of eScholarship@UMMS. For more information, please contact [Lisa.Palmer@umassmed.edu](mailto:Lisa.Palmer@umassmed.edu).

# BMI, Gestational Weight Gain & Angiogenic Biomarker Profiles for Preeclampsia Risk



Tiffany A. Moore Simas, MD, MPH, MEd<sup>1</sup>; Sharon E. Maynard, MD<sup>2</sup> and Xun Liao, MS<sup>1</sup>

<sup>1</sup>Department of Ob/Gyn, University of Massachusetts Medical School, Worcester, Massachusetts, United States

<sup>2</sup>Department of Medicine, George Washington University, Washington, District of Columbia



## Background

- In May 2009, after considering short and long-term maternal/child outcomes, the Institute of Medicine (IOM) revised recommendations for gestational weight gain (GWG); however preeclampsia was dismissed due to insufficient evidence. *IOM 2009*
- Since change in recommendations, epidemiologic studies have since been published that support an association between GWG adherence and hypertensive disease of pregnancy. *AJOG 2009;200(2):167.e1-7*
- Numerous studies have revealed adipose tissue's ability to stimulate angiogenesis. *Cardiovascular Res 2008;78(2):286-93*

## Objective

To evaluate preeclampsia risk by angiogenic-biomarker profile by both BMI and GWG-adherence.

## Hypothesis

We hypothesized that overweight/obese (OW-OB) women and over-gainers (OG) would have altered angiogenic profiles as compared to underweight/normal-weight (U-N) women and under-/appropriate-gainers (U-AG), respectively.

## Materials & Methods

- Pregnant subjects <24 weeks gestation enrolled from outpatient prenatal clinics at UMass Memorial Health Care between May 2004 and January 2006.
- Each subject had ≥1 of the following risk factors for preeclampsia:

Inclusion Criteria	RR
Chronic HTN	2.37
Renal Disease/CKD	-----
Pregestational DM	3.56
History of Preeclampsia	7.19
Teen Pregnancy (≤ 18)	2.98
Multi-fetal gestation	2.93 (twins) 2.83 (triplets)
Obesity (BMI > 30)	2.47
APL Ab Syndrome	9.72
SLE	-----

*Duckitt K & Harrington D. BMI. 2005*

- Subjects recruited **127**
- Exclusions:
  - missing outcomes: 3
  - gestational HTN: 5
  - multiple gestations<sup>a</sup>: 25
  - preeclampsia diagnosis<sup>b</sup>: 12

Subjects included in analyses **82 (342 samples)**

- Excluded due to association with altered angiogenic profile:
  - Multiple gestations (n=20) *Maynard et al, AJOG, 2008;198:200*
  - Hypertensive diseases of pregnancy (gestational HTN & preeclampsia) *Moore Simas et al, AJOG, 2007;197:244.e1-244.e8*

sFlt1, PlGF and sEng levels were measured by ELISA

BMI & GWG adherence categories by 1990 IOM recommendations

Pre-pregnancy BMI Category	Pre-pregnancy BMI* (kg/m <sup>2</sup> )	Total GWG at 40 weeks
Underweight (U)	<19.8	28-40 lbs
Normal weight (N)	19.8-26.0	25-35 lbs
Overweight (OW)	26.1-29.0	15-25 lbs
Obese (OB)	>29.0	At least 15 lbs

Adherence defined by GWG and GA @ last prenatal visit subtracted from pre-pregnancy weight; thus preterm and term deliveries included

## Statistical Analysis

- Demographic comparisons utilized Fisher exact test for categorical variables and Wilcoxon rank sum test for continuous variables (see Table 1)
- Within-women correlation and right-skewness handled by estimating linear mixed models for ln-transformed biomarkers and then exponentiating on ln scale (i.e., geometric means).
- Geometric mean and 95% confidence intervals displayed for sFlt1, PlGF and (sFlt1+sEng):PlGF in each of 3 gestational-age windows for UW-N vs. OW-OB BMI and Under-Appropriate vs. Over-gainers (see figures 1-6)
- T-test compared means in 3 windows.

## Results

- Analytic sample included **82 subjects (342 specimens)**. See Table 1 for Demographic Comparisons.
- BMI Comparisons** (see Figures 1-3)
  - Mean sFlt1 lower in all windows in OW-OB compared to U-N (Figure 1)
  - Mean PlGF lower in all windows in OW-OB compared to U-N (Figure 2)
  - Mean ratio [(sFlt1+sEng):PlGF] trended higher in OW-OB compared to U-N women at 27-30 and 31-36wks (Figure 3)
- GWG Adherence Comparisons** (see Figures 4-6)
  - Mean sFlt1 lower in all windows in OG compared to U-AG (Figure 4)
  - Mean PlGF lower in all windows in OG compared to U-AG (Figure 5)
  - Mean ratio [(sFlt1+sEng):PlGF] trended higher in OG compared to U-AG at 31-36wks (Figure 6)

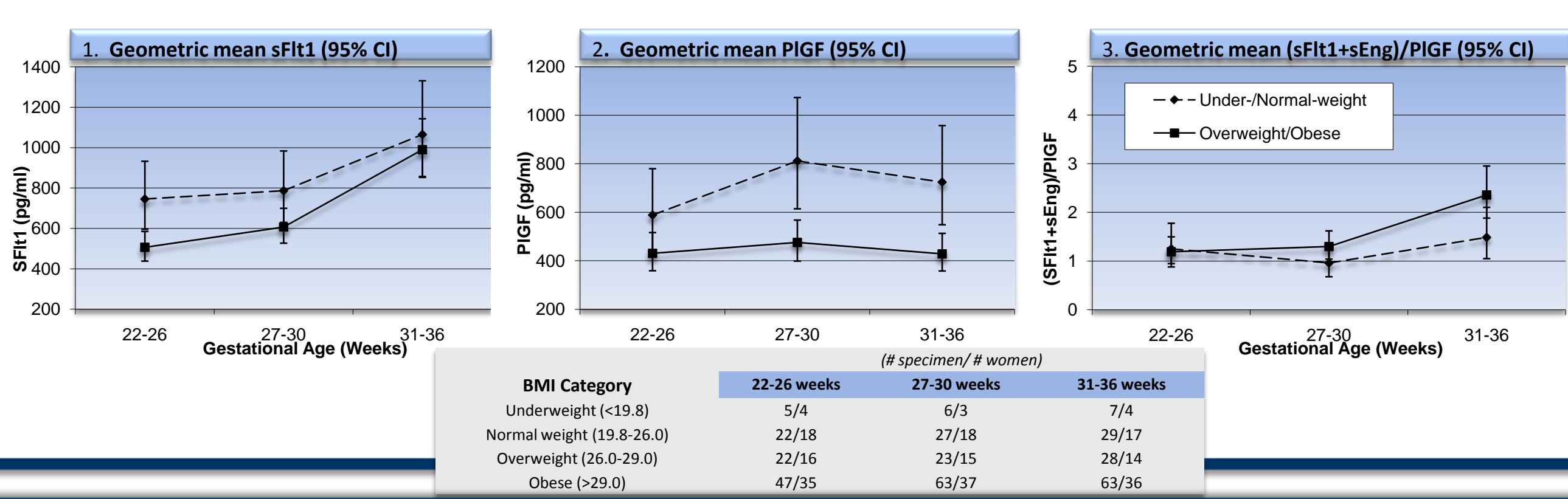
Table 1. Demographic comparisons

Demographic Characteristics	BMI Categories			GWG Adherence Categories		
	Underweight -Normal	Overwgt- Obese	P-Value	Under/Approp Gain	Over-Gain	P-Value
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Age (years)	25.9±8.5	31.1±6.6	0.01	29.6±7.9	29.5±7.4	NS
Gravity	2.4±1.7	2.9±1.8	NS	2.9±2.1	2.7±1.5	NS
Living Children	0.8±1.1	1.0±1.0	NS	0.9±1.1	0.9±1.0	NS
GA @ first PNV (wk)	11.8±4.4	12.0±6.0	NS	11.8±4.8	12.0±6.3	NS
SBP @ first PNV (mmHg)	114.0±12.5	119.5±13.7	NS	117.1±14.2	119.1±13.1	NS
DBP at first PNV (mmHg)	67.1±5.1	70.8±9.6	NS	70.0±8.4	69.9±9.4	NS
GA at delivery (wks)	38.6±2.2	38.0±2.7	NS	38.6±2.0	37.9±2.8	NS
Placenta weight (g)	443.8±90.1	443.6±206.9	NS	526.4±155.7	371.3±176.2	NS
	N (%)	N (%)		N (%)	N (%)	
Race/ethnicity			0.05			NS
White	13 (54.2)	35 (60.3)		19 (55.9)	29 (60.4)	
Hispanic	10 (41.7)	13 (22.4)		10 (29.4)	13 (27.1)	
Black	0 (0)	9 (15.5)		4 (11.8)	5 (10.4)	
Other	1 (4.2)	1 (1.7)		1 (2.9)	1 (2.9)	
Smoking Status			NS			NS
Current	1 (4.2)	6 (10.3)		4 (11.8)	3 (6.3)	
Prior Pregnancy	6 (25.0)	9 (15.5)		5 (14.7)	10 (20.8)	
Never	17 (70.3)	43 (74.1)		25 (73.5)	35 (72.9)	
Chronic HTN	3 (12.5)	17 (29.3)	NS	9 (26.5)	11 (22.9)	NS
Pregestational DM	6 (25.0)	22 (37.9)	NS	10 (29.4)	18 (37.5)	NS
Renal Disease	4 (16.7)	1 (1.7)	0.02	5 (14.7)	0 (0)	0.01
Adolescent Pregnancy	8 (33.3)	6 (10.3)	0.02	7 (20.6)	7 (14.6)	NS
History Preeclampsia	4 (16.7)	9 (15.5)	NS	7 (20.6)	6 (12.5)	NS
Lupus	4 (16.7)	2 (3.5)	NS	4 (11.8)	2 (4.2)	NS
Antiphospholipid Syndrome	0 (0)	2 (3.5)	NS	0 (0)	2 (4.2)	NS

## Limitations

- Small sample size required collapsing of BMI and GWG-adherence categories; thus unable to look at adherence within each BMI category
- Secondary analysis not powered for this exploratory analysis
- Only had total GWG at end of pregnancy

Figures 1-3. Angiogenic biomarker profiles comparing under-/normal-weight to overweight/obese at 3 gestational age windows



Figures 4-6. Angiogenic biomarker profiles comparing under/appropriate gainers to over-gainers at 3 gestational age windows

