

Objective 2

Current recommendations for optimal weight gain during pregnancy



Pregnancy weight gain over the years...

Up to the 1920's – focus on physical beauty, clothing, cosmetics and slenderness

“The pregnant woman should exercise some care of her diet. ... **She should eat rather less during early pregnancy than other times;**”
 Connelius Clifford Venderbeck, M.D.
 Pancoast Ladies' New Medical Guide, 1890, pp585

EXPECT
 TO LOOK
 YOUR
 PRETTIEST



PART I: suburbia
 If you're having a baby, you couldn't have picked a better time than the present for looking pretty while you wait. Fashion's on your side, with some of the most attractive ideas in ages to set off that special glow you're wearing. Starting here, in a suburban setting: the slim, trim look. No billows, no turbelaws; this simple, easy line is one to live in, to look your best in.
 ● Opposite: A slim, square-yoked denim pull-over and skirt (both with easy back pleats). Also in gold. Sizes 8 to 16; about \$13. Not shown: Matching slim-jim denim pants; about \$6. Jess Sharaf.
 ● Right: Ticking-striped denim coat—cardigan-bound and, in this instance, big-city-bound (though you'd wear it everywhere on the map). Also in gold. Sizes 8 to 16; about \$15. Stern-Made. All these in washable Avondale cotton.

Maternity
 STYLE BOOK *Free*

LANE BRYANT Maternity clothes enable you to dress stylishly during all stages of maternity—and after baby comes, as well.

Designed to conceal condition and to provide for expansion.

Latest styles in Dresses and Corsets. Also apparel for baby. Style Book FREE; send today.

LANE BRYANT
 Address Dept. 49
 Fifth Ave. at 39th St., New York



“Pregnancy is essentially a problem in nutrition”
 J. Morris Slemmons, 1919

“Eating for two: shaping mothers’ figures and babies’ futures”

Lisa Cody

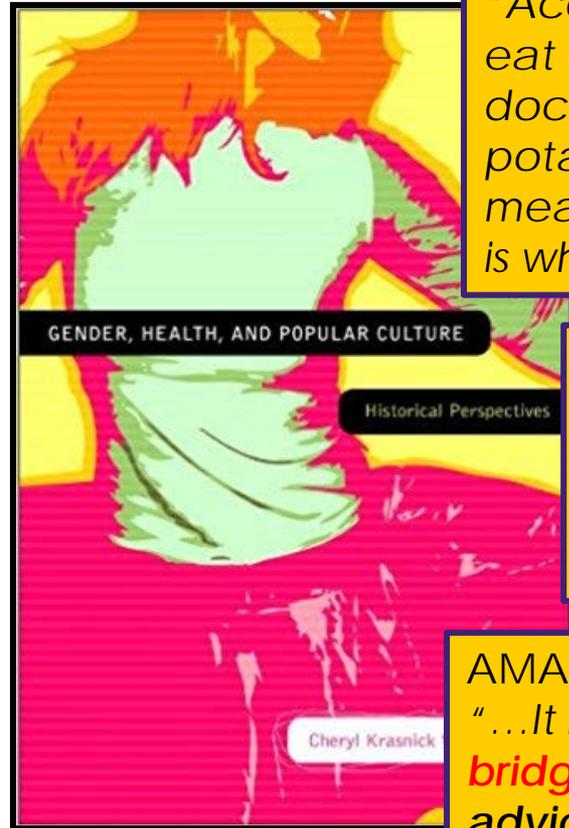
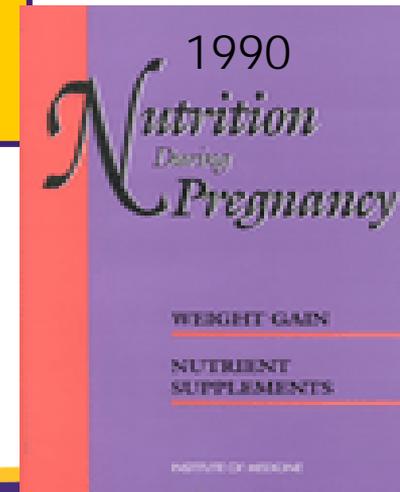
Post 1920, obstetrical texts began to focus on weight gain, acknowledging that middle class women had easy access to food and drink

Patient to Federal Children’s Bureau, 1926
“According to one doctor, I am allowed to eat everything ‘on earth’ while another doctor tells me to eat nothing but milk, potatoes, butter, no eggs, vegetables or meat. I am in a great predicament as which is which”

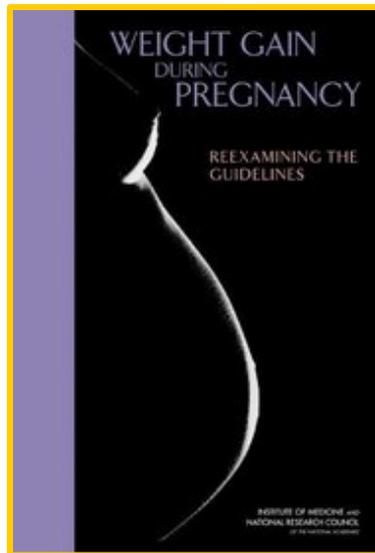


AMA Vice President, William J. Carrington
“...excessive calories do not go into the baby’s sinews but are stored as fat in odd and embarrassing places about the body of the mother” 1944

AMA Vice President, William J. Carrington
*“...It is a mistake to overeat, although many **bridge table experts** give the gratuitous advice that a mother expecting must eat for two”* 1944



Pregnancy weight gain recommendations



Total
Gain



Rate per
week

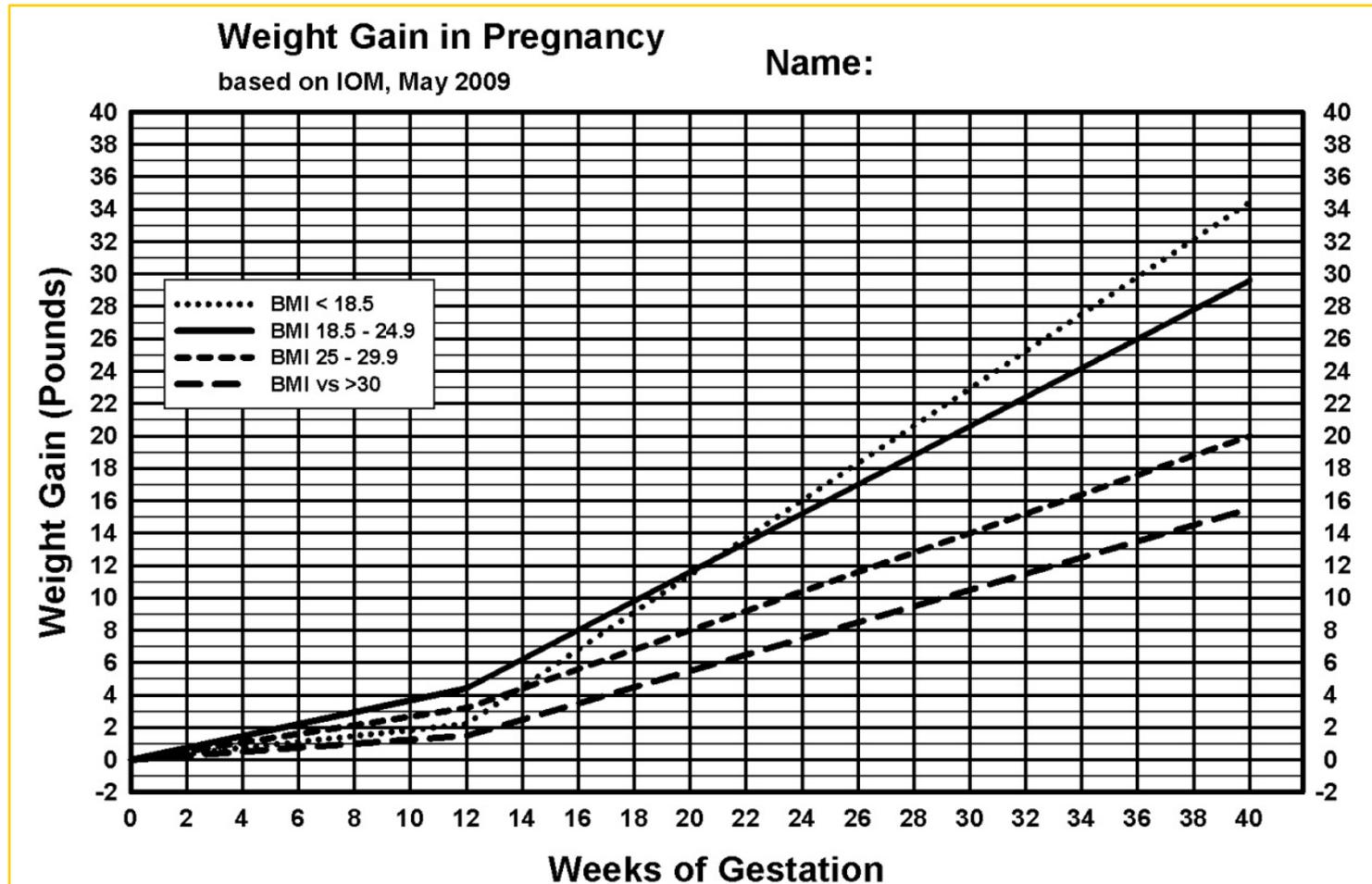


Prepregnancy BMI	Total Weight Gain		Rates of Weight Gain* 2nd and 3rd Trimester	
	Range in kg	Range in lbs	Mean (range) in kg/week	Mean (range) in lbs/week
Underweight (< 18.5 kg/m ²)	12.5-18	28-40	0.51 (0.44-0.58)	1 (1-1.3)
Normal weight (18.5-24.9 kg/m ²)	11.5-16	25-35	0.42 (0.35-0.50)	1 (0.8-1)
Overweight (25.0-29.9 kg/m ²)	7-11.5	15-25	0.28 (0.23-0.33)	0.6 (0.5-0.7)
Obese (≥ 30.0 kg/m ²)	5-9	11-20	0.22 (0.17-0.27)	0.5 (0.4-0.6)

*Calculations assume a 0.5-2 kg (1.1-4.4 lbs) weight gain in the first trimester (based on Siega-Riz et al., 1994; Abrams et al., 1995; Carmichael et al., 1997).

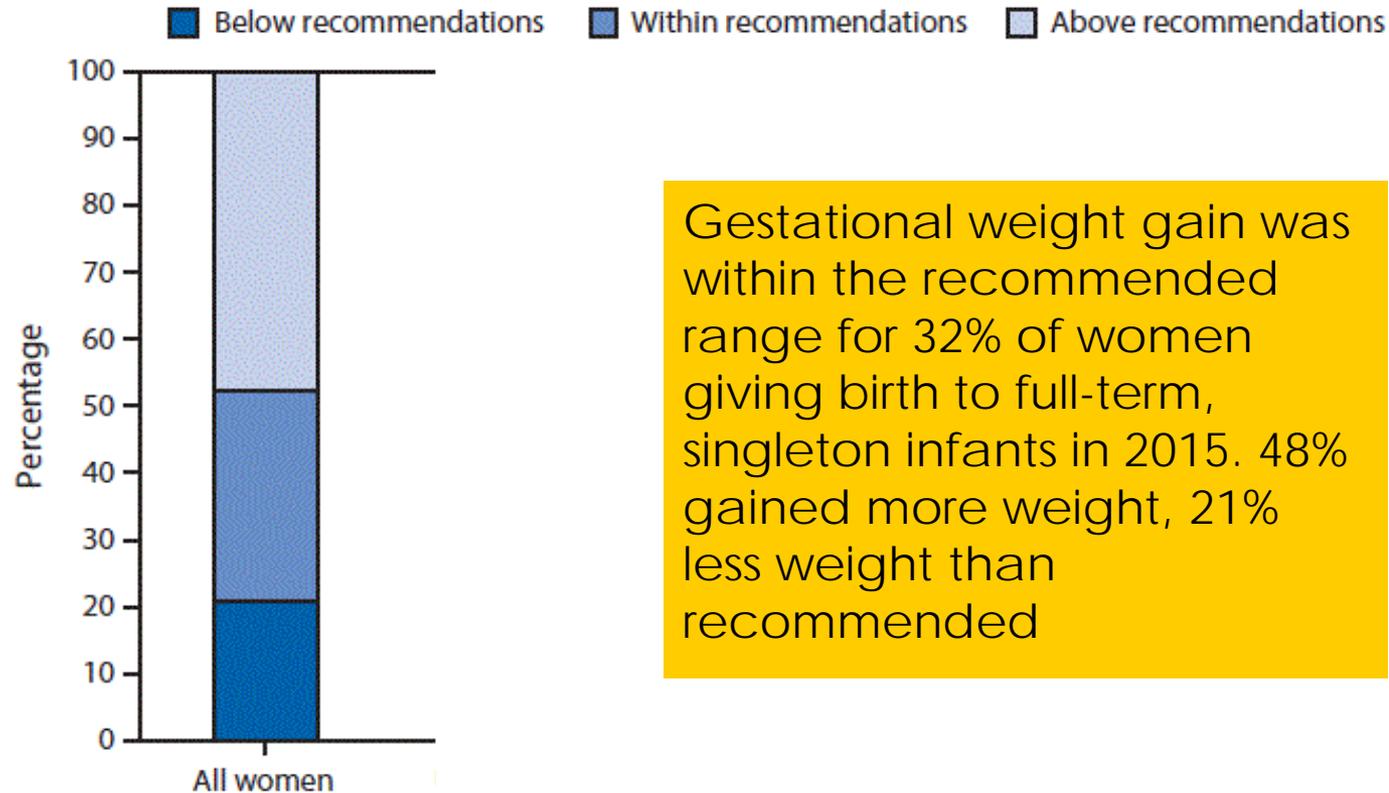
IOM Developed a ToolKit

IOM recommended tracking weight at doctor visits



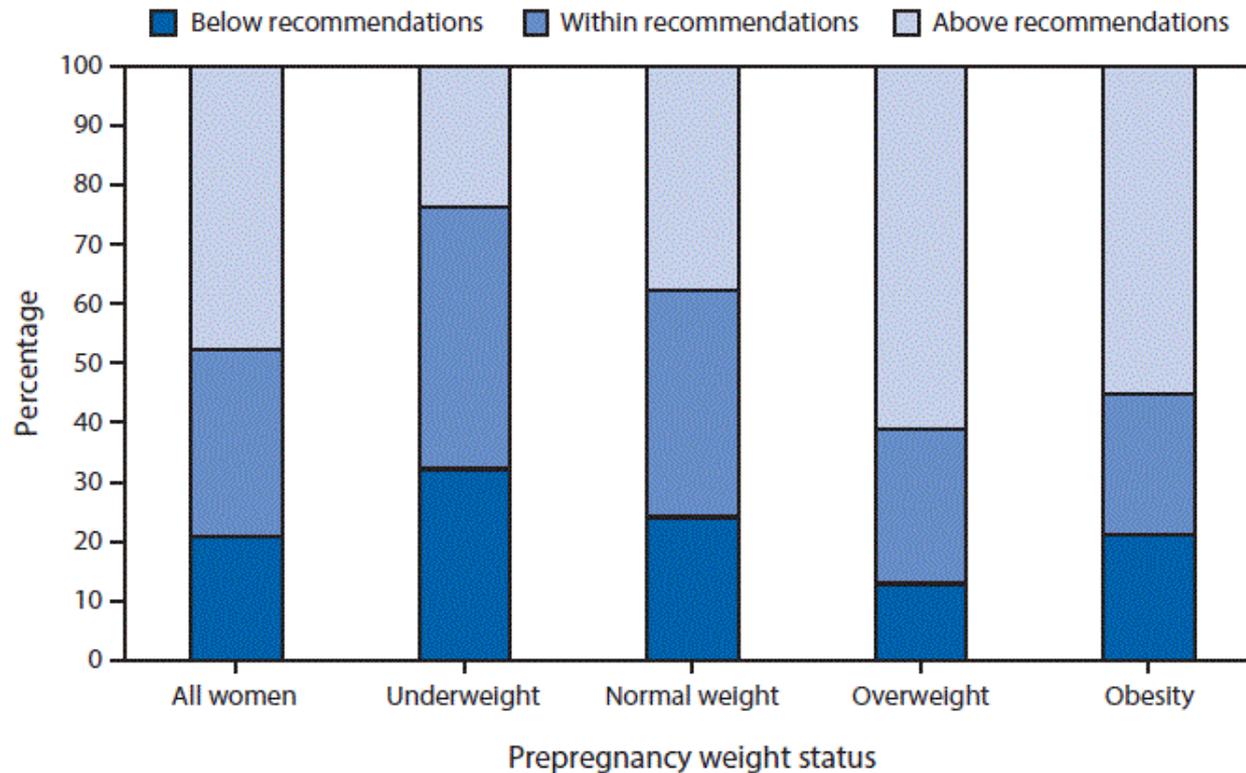
Source: Weight Gain During Pregnancy: Reexamining the Guidelines., 2009

Prevalence of gestational weight gain in US women – 2015



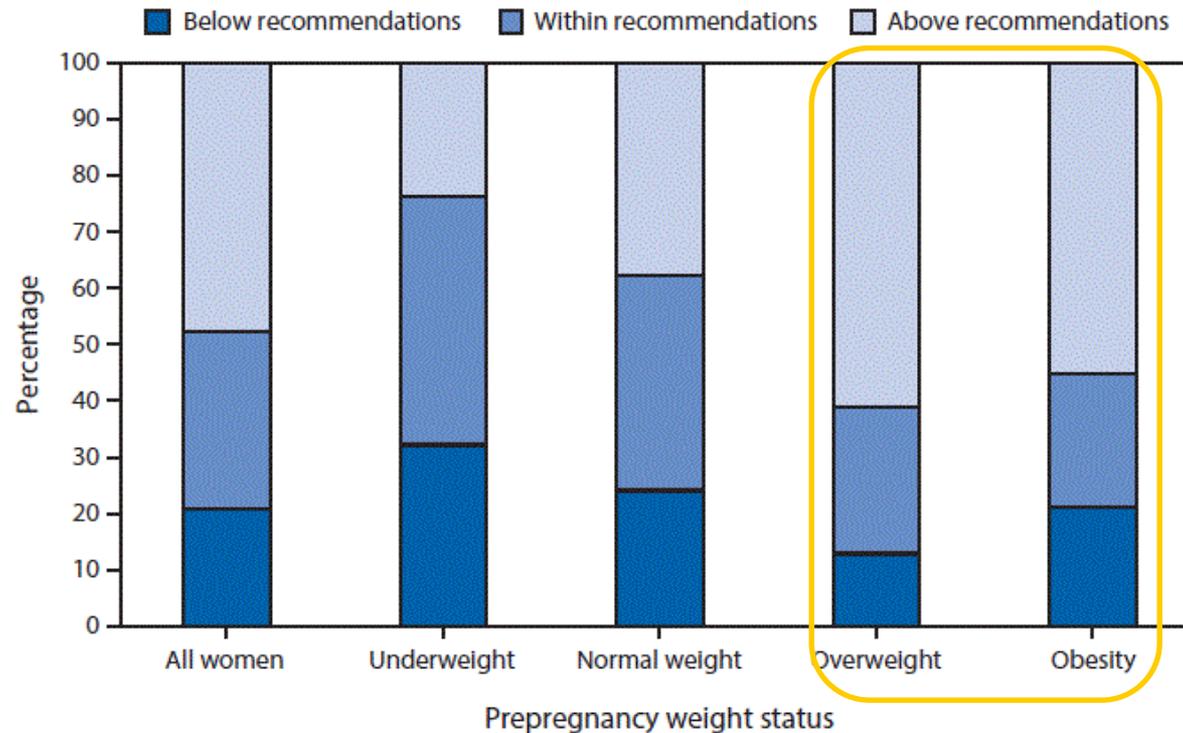
Gestational weight gain was within the recommended range for 32% of women giving birth to full-term, singleton infants in 2015. 48% gained more weight, 21% less weight than recommended

Excess gestational weight gain is more prevalent in women with overweight/obesity



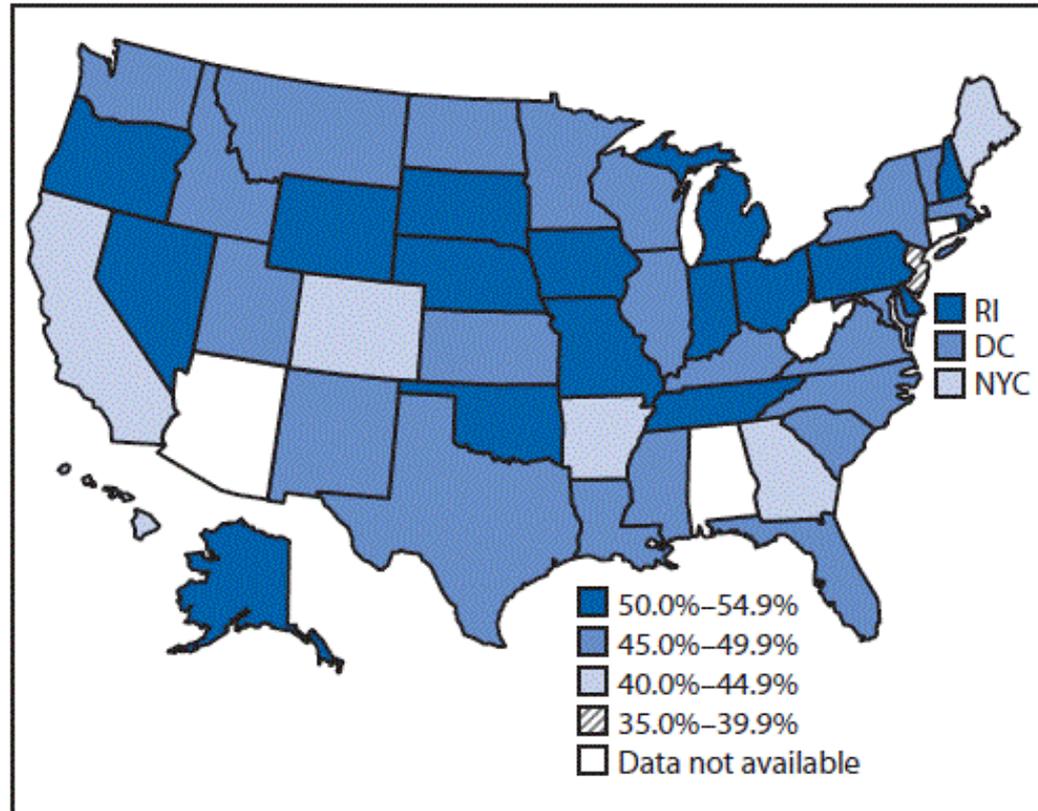
39% of women who were normal weight gained **WITHIN**, compared to only 26% women who were overweight, and 24% women with obesity before pregnancy.

Excess gestational weight gain is more prevalent in women with overweight/obesity



Weight gain above the recommendations was highest among women who were overweight (61%) or obesity (55%) before pregnancy.

Prevalence of excess gestational weight gain in US women – 2015



QuickStats: Gestational Weight Gain Among Women with Full-Term, Singleton Births, Compared with Recommendations — 48 States and the District of Columbia, 2015. *MMWR Morb Mortal Wkly Rep* 2016;65:1121. DOI: <http://dx.doi.org/10.15585/mmwr.mm6540a10>.

Where does pregnancy weight gain go?

For a woman
with BMI 20-
24.9 kg/m²
at
conception

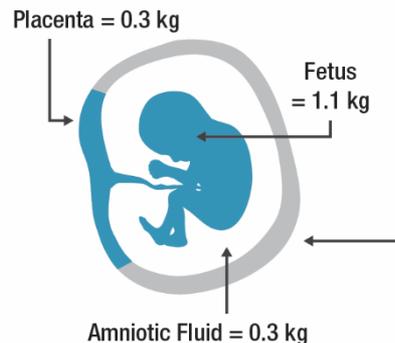
EARLY GESTATION (0 TO < 24 WEEKS)

Composition of Maternal Unit = +3.6 kg



Blood = 1.7 kg
Uterus & Breast = 1.1 kg
Extracellular Fluid = 0.2 kg
Other Tissues (Fat) = 0.6 kg

Composition of Fetal Unit = +1.7 kg



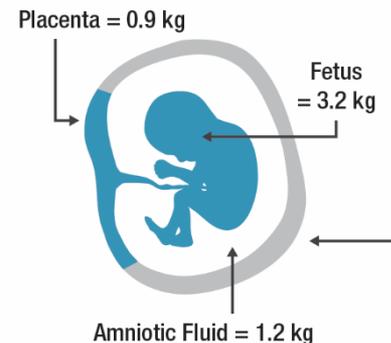
TOTAL GESTATION (0 TO 40 WEEKS)

Composition of Maternal Unit = +7.0 kg



Blood = 2.0 kg
Uterus & Breast = 1.7 kg
Extracellular Fluid = 1.7 kg
Other Tissues (Fat) = 1.6 kg

Composition of Fetal Unit = +5.3 kg

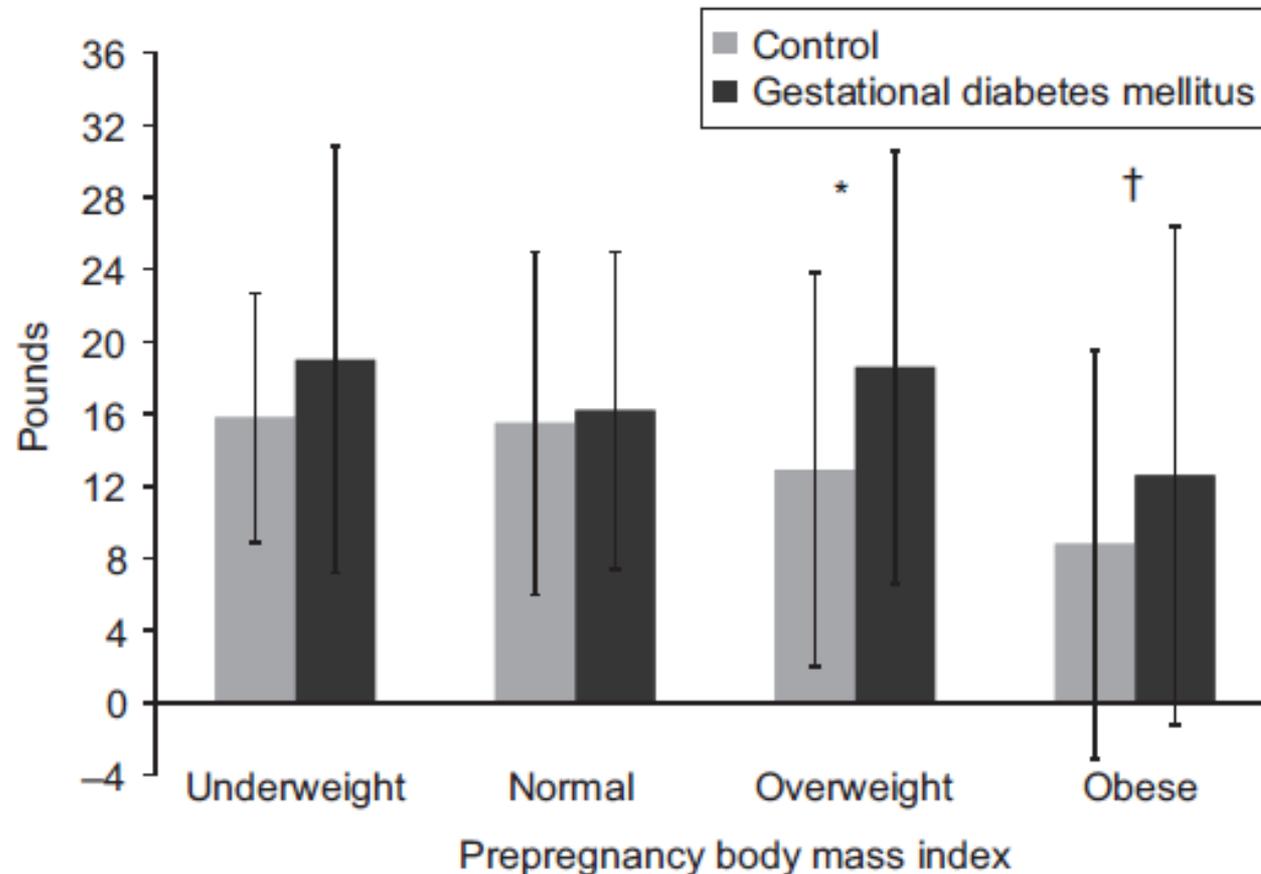


More pregnancy weight gain = more fat gained!

BMI category	Weight gain category (n)*	Body weight gain (kg) ^{††}	Fat gain (kg) [‡]
Underweight (BMI < 19.8 kg/m ²)	Less than recommended (6)	7.9 ± 1.6	0.6 ± 1.9
	Recommended (7)	12.6 ± 2.4	6.0 ± 2.6
	More than recommended (8)	16.1 ± 3.9	6.9 ± 3.5
	All underweight women (21)	12.6 ± 4.4	4.8 ± 3.8
Normal weight (BMI = 19.8–26)	Less than recommended (31)	8.6 ± 1.9	1.3 ± 3.0
	Recommended (46)	12.1 ± 3.4	3.8 ± 3.5
	More than recommended (41)	15.2 ± 3.4	6.0 ± 3.1
	All normal weight women (118)	12.2 ± 4.0	3.9 ± 3.7
Overweight (BMI >26–29)	Less than recommended (7)	8.5 ± 3.2	0.3 ± 2.5
	Recommended (9)	9.1 ± 3.1	2.8 ± 4.1
	More than recommended (13)	13.6 ± 5.1	4.2 ± 6.9
	All overweight women (29)	11.0 ± 4.6	2.8 ± 5.4
Obese (BMI >29)	Less than recommended (7)	3.2 ± 2.7	-5.2 ± 1.5
	Recommended (6)	6.9 ± 4.4	-0.6 ± 4.6
	More than recommended (15)	12.0 ± 4.6	3.1 ± 3.9
	All obese women (28)	8.7 ± 5.6	0.2 ± 5.0

GWG and Incidence of Gestational Diabetes

N=652, retrospective chart review (2006-2009)
Weight gain until 24w
GDM Dx (50g >200mg/dl or 100g), N=163



N=3,386, prospective cohort study
 Births 1981-1984 – 21y follow-up
 Owt – 12%, Obese – 4%
 Self-report DM!

Table 4. Odds ratio (OR) of diabetes at 21 years post-partum by the IOM categories of gestational weight gain (N = 3386).

Model	Odds Ratio (95% confidence interval) of diabetics at 21 years by IOM categories		
	Inadequate	Adequate (reference)	Excess
Model 1	1.02(0.73,1.42)	1.00	1.47(1.11,1.94)
Model 2	1.00(0.72,1.40)	1.00	1.42(1.07,1.89)
Model 3	0.99(0.71,1.39)	1.00	1.40(1.06,1.86)
Model 4	1.05(0.75,1.48)	1.00	1.09(0.79,1.50)
Model 5			
Pre-pregnancy BMI < 25 kg/m ² (n = 2870)	1.00(0.69,1.45)	1.00	1.09(0.78,1.53)
Pre-pregnancy BMI ≥ 25 kg/m ² (n = 516)	1.12(0.50,2.52)	1.00	1.66(0.91,3.03)
Model 6			
Pre-pregnancy BMI < 25 kg/m ² (n = 2870)	1.05(0.72,1.54)	1.00	0.91(0.63,1.33)
Pre-pregnancy BMI ≥ 25 kg/m ² (n = 516)	1.16(0.51,2.64)	1.00	1.54(0.83,2.85)

Model 1- adjusted for IOM categories and maternal age at first clinic visit.

Model 2- adjusted for model 1 plus maternal smoking during pregnancy, parity, maternal educational attainment, race, TV watching and exercise before pregnancy.

Model 3- adjusted for model 2 plus breastfeeding duration.

Model 4- adjusted for model 3 plus BMI at 21 years.

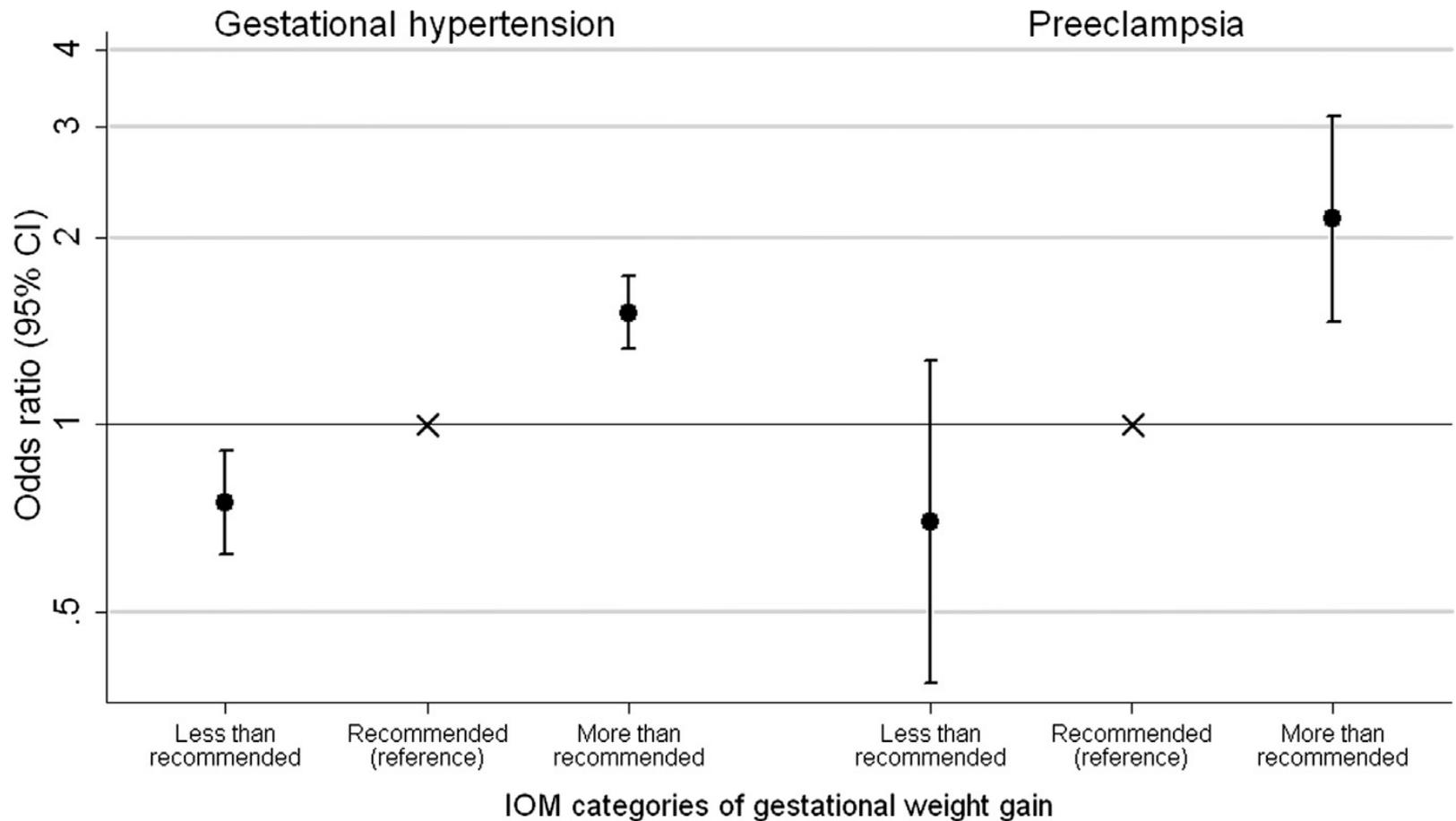
Model 5- model 3 results are repeated stratifying by the maternal pre-pregnancy BMI ≥ 25 kg/m² and BMI < 25 kg/m².

Model 6- model 3 is repeated further adjusting for maternal BMI at 21 years.



GWG and hypertensive disorders

N=12,552, Avon longitudinal study

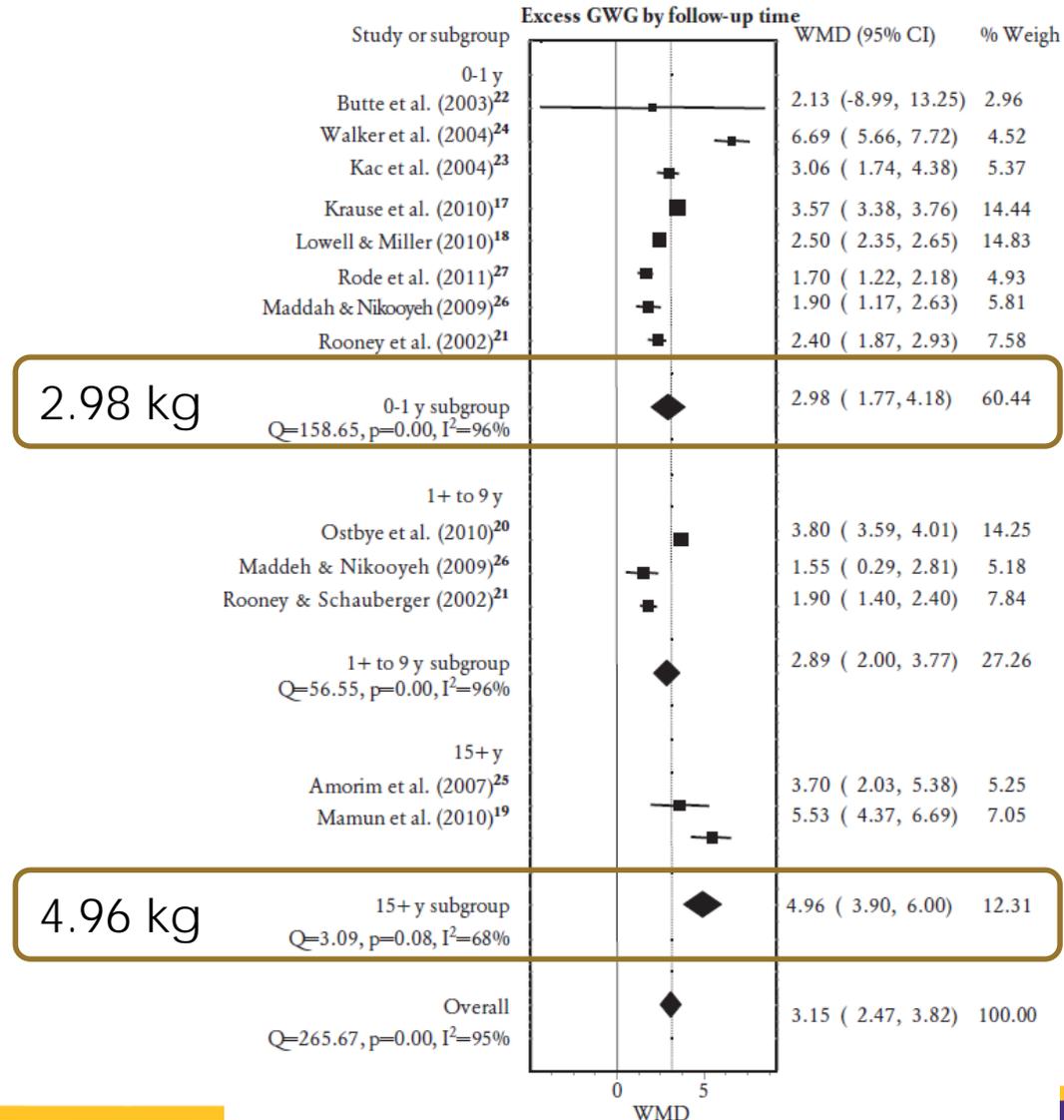




Postpartum weight retention - biggest concern for development of metabolic dysfunction?

Meta-analysis: 11 studies
Postpartum follow-up:
0-1y, 1-9y and ≥15y

>68,000 women
Ideal vs Excess gain



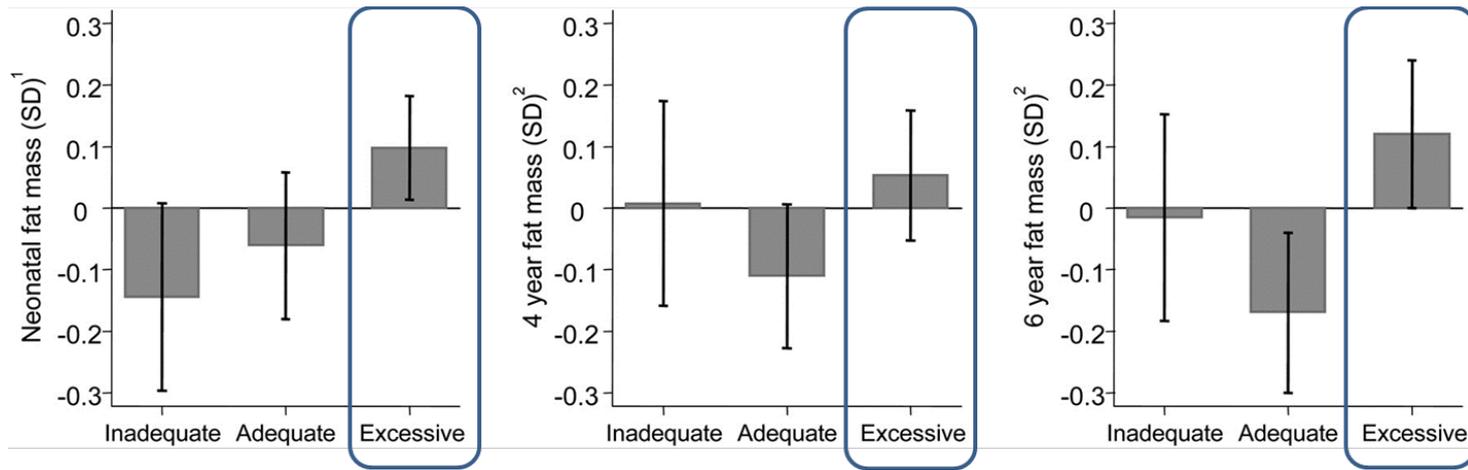


Linear relationship between GWG and infant adiposity at birth

Weight gain in pregnancy and childhood body composition: findings with from the Southampton Women's Survey¹⁻³

Sarah R Crozier, Hazel M Inskip, Keith M Godfrey, Cyrus Cooper, Nicolas C Harvey, Zoë A Cole, Siân M Robinson, and the Southampton Women's Survey Study Group

948 children who had DXA at birth, 4y and 6y
40% of infants were born to women with excess GWG



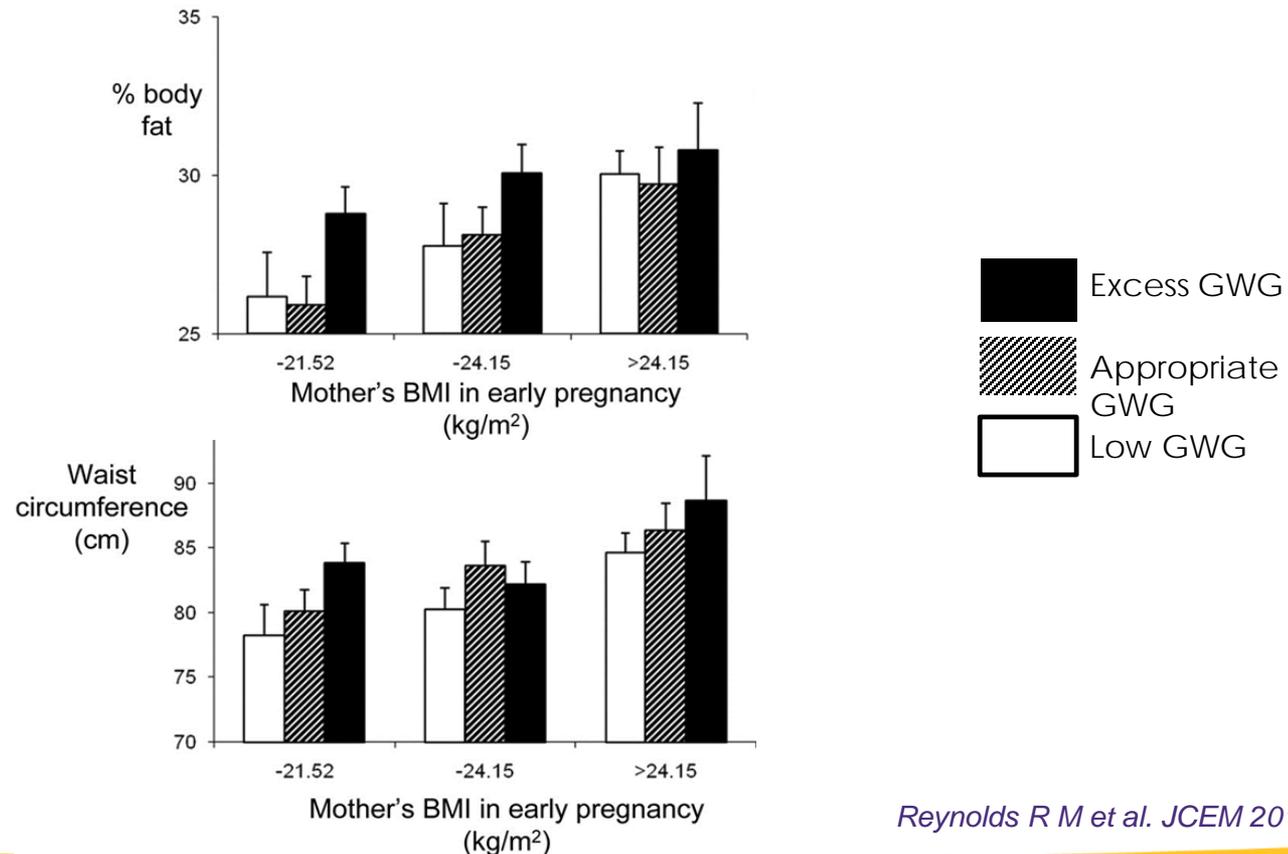


Lasting effects on GWG and offspring adiposity in adulthood

Maternal BMI, Parity, and Pregnancy Weight Gain: Influences on Offspring Adiposity in Young Adulthood

R. M. Reynolds, C. Osmond, D. I. W. Phillips, and K. M. Godfrey

N=276 men and women, characterization of mothers pregnancy





Timing of GWG may also be important for neonate adiposity

N= 172 singleton gestation

Pregravid BMI associated with:

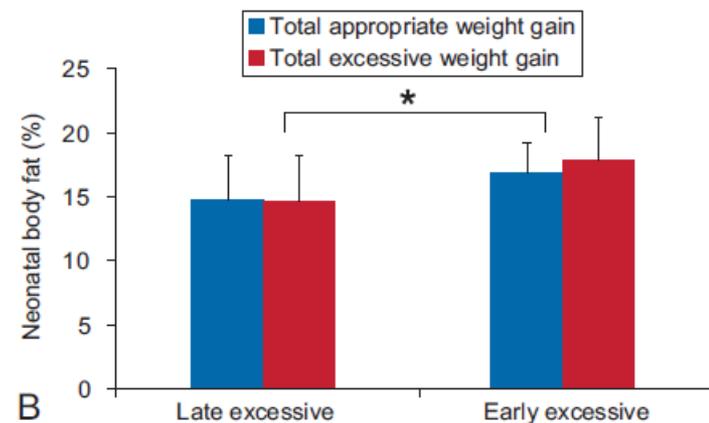
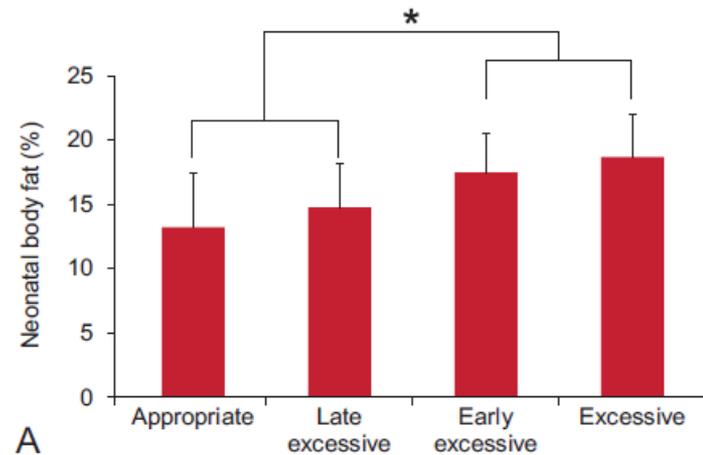
- GWG
- neonatal FM

52% women exceeded IOM

Macrosomia

- Normal wt - 5%
- Overweight - 12%
- Obese - 28%

Early GWG = pregravid to 16-20 GA
Late GWG = 16-20 to delivery





The 'double burden' of maternal BMI and pregnancy weight gain - it's a vicious cycle...

