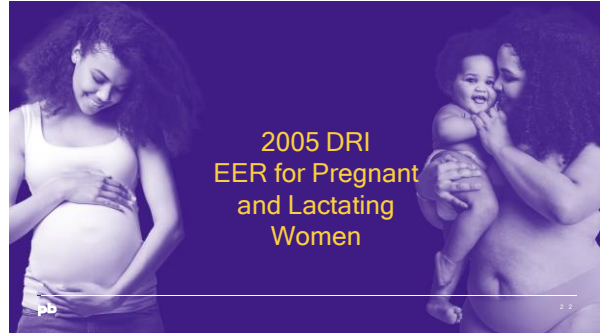


Energy Requirements to Support Pregnancy Weight Gain and Lactation at Varying BMIs

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2005 DRI EER for Pregnant and Lactating Women



Estimated Energy Requirements (EER)

"The Estimated Energy Requirement (EER) is defined as the average dietary energy intake that is predicted to maintain energy balance in a healthy, adult of a given gender, weight, height, and level of physical activity with good health."

In...pregnant or lactating women, the EER includes the needs associated with the deposition of tissues or the secretion of milk at rates consistent with good health."



Dietary Reference Intakes, 2005
Chapter 5: Energy, Pg 107

Evidence Considered in 2005

TEE:

- 4 studies of DLW in pregnant women (pregravid weight ~61kg and weight gain ~12kg)
- Δ TEE was -57 to 107 kcal per week
- Median change in TEE was **8 kcal per week** of gestation

Growth of maternal and fetal tissue:

- Energy equivalents for protein (FFM) = 5.6 kcal/d
- Energy equivalent for fat (FM) = 9.5 kcal/d
- 9 studies *normal weight* women to evaluate mean fat gain (3.7 kg) and mean energy deposition of **180 kcal/d**.



Dietary Reference Intakes, 2005, Chapter 5: Energy, Pg 106

The EER for Pregnant women in 2005

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$$EER_{\text{pregnant}} = EER_{\text{nonpregnant}} + \text{TEE during pregnancy} + \text{energy deposition}$$

$$EER_{\text{nonpregnant}} = 354 - 6.91 \times \text{age(y)} + 9.36 \times \text{wt(kg)} + 726 \times \text{height(m)} + \text{PA}$$

Where: PA is 1.00 for PAL <1.4, 1.12 for 1.4 ≤ PAL ≤ 1.59, 1.27 for 1.6 ≤ PAL ≤ 1.89, 1.45 for 1.9 ≤ PAL ≤ 2.5

1st trimester = adult woman EER + 0 + 0

2nd trimester = adult woman EER + 160 kcal (8 kcal/wk × 20 wk) + 180 kcal (+340 kcal/d)

3rd trimester = adult woman EER + 272 kcal (8 kcal/wk × 34 wk) + 180 kcal (+452 kcal/d)

pb Dietary Reference Intakes, 2005
Chapter 8: Energy Pg. 81

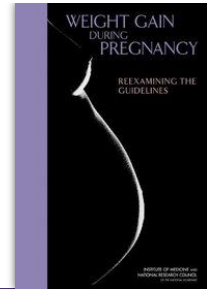
2009 IOM Recommendation

First trimester, when weight gain is minimal, **no extra calories usually are needed**.

Second trimester, you need an **extra 340 calories a day**, and

Third trimester, about **450 extra calories a day**.

“Keep in mind that these amounts are for women who were a *normal weight* before pregnancy. If you are overweight or obese, you may need *fewer* extra calories.”



pb Source: Institute of Medicine, Weight Gain During Pregnancy Report, 2009

Since 2005, new evidence to consider

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1. Revised gestational weight gain guidelines and prevalence of excess weight gain
2. Data in pregnant people with obesity
3. Non-white race

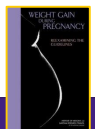
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Weight gain recommendations for pregnant women

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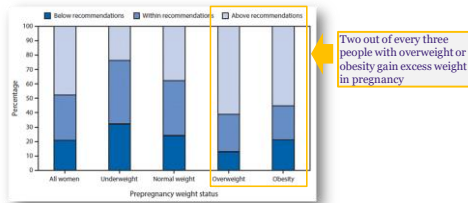
Prepregnancy BMI	Total Weight Gain		Rates of Weight Gain* 2nd and 3rd Trimester	
	Range in kg	Range in lbs	Mean (range) in kg/week	Mean (range) in lbs/week
Underweight (< 18.5 kg/m ²)	12.5-18	28-40	0.51 (0.44-0.58)	1 (1-1.3)
Normal weight (18.5-24.9 kg/m ²)	11.5-16	25-35	0.42 (0.35-0.50)	1 (0.8-1)
Overweight (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).



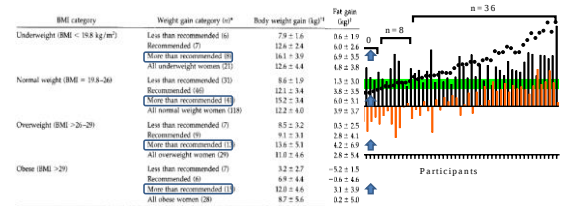
pb Source: Institute of Medicine, Weight Gain During Pregnancy Report, 2009

Adherence to the 2009 IOM guidelines is different based upon pregravid BMI



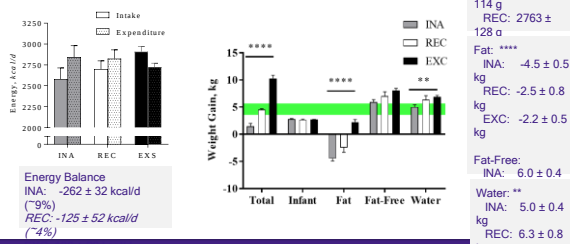
pb Source: *Matr Mortal Wkly Rep* 2016;65:1221.

Excess GWG reflects gains in fat mass



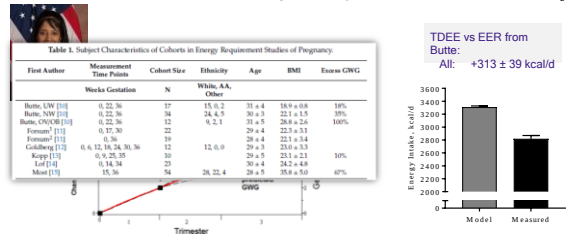
pb Source: *Matr Mort Wkly Rep* 2016;65:1221. *Leiberman et al 1997 Clin Obst Gynecol* 40(4): 403-08

New information on gestational TEE with obesity



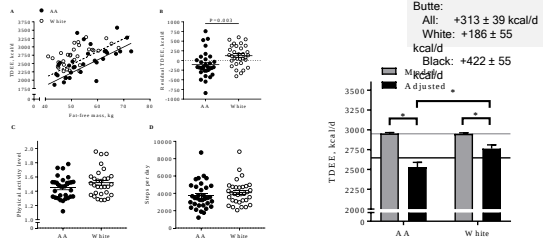
pb Source: *Matr Mort Wkly Rep* 2016;65:1221. *Matr Mort Wkly Rep* 2016;65:1221. *Matr Mort Wkly Rep* 2016;65:1221.

Implications for not considering obesity and GWG



pb Source: *Matr Mort Wkly Rep* 2016;65:1221. *Matr Mort Wkly Rep* 2016;65:1221. *Matr Mort Wkly Rep* 2016;65:1221.

Consideration of non-white race



Most et al., Obesity (Silver Spring). 2020 Feb;28(2):268-276

EER for Lactation

The 2005 report included 5 studies in lactating people from 1 to 6 months postpartum, exclusively breastfeeding, normal weight.

EER = measured TEE (DLW) + milk energy output – energy mobilized from tissues (weight loss)

• ERR Birth - 6 months = adult EER + 500 – 170

• ERR 6 – 12 months = adult EER + 400 – 0*

Assumes weight stability at 6 months postpartum.

pb Is the Trajectory of Body Fatness "Set" in Utero?

FOOD 124556, Redman & Phelan

Since 2005, new evidence to consider

1. EER for non-exclusive lactation
2. Excess gestational weight gain and postpartum weight retention

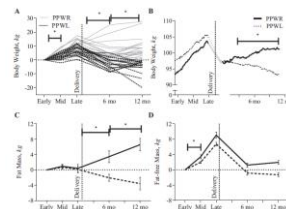
¹CDC Breastfeeding Report Card
25.6% exclusive bf through 6 months

Major contributor to excess GWG is FM
An average 3kg FM Gain ($\times 9.5$ kcal/g) =
33,500 kcal stored energy for lactation

²A 500 kcal/d energy deficit in lactation
doesn't impact milk in women with OW/OB

Source:
1. 2020 CDC Breastfeeding Report Card, Table 2.
2. Bertz F et al. Am J Clin Nutr 2012;96:689-705, Lovelady C. Proc Nutr Soc 2011;70:181-184.

Since 2005, new evidence to consider



Women with PPWL decreased energy intake:
-356 $\pm$ 115 kcal/d, 0 to 6 months and
-327 $\pm$ 142 kcal/d, 6 to 12 months.

Women with PPWR increased energy intake:
262 $\pm$ 101 kcal/d 0 to 6 months and
259 $\pm$ 124 kcal/d, 6 to 12 months.

Source:
Most J., Redman LM. J Clin Endocrinol Metab. 2020 Apr 1;105(4):e1601-11

Conclusion - 1

- Pregnancy is an energy costly process.
- EER are different for gestation and based on pregravid body size.
- 2005 DRI do not consider gestational weight gain. Many women in those studies had excess weight gain.
- New studies of pregnant women with obesity suggest they do not need to increase caloric intake to achieve weight gain recommendations.



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Conclusion - 2

- The majority of lactating people in the US, are not doing so exclusively.
- Excess weight gained in pregnancy is retained at 6 and 12 months postpartum.
- The postpartum period is often the pregravid period of the next pregnancy and calorie deficits might be recommended for people having excess GWG or overweight and obesity.



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labs.pbrc.edu/womenshealth

Can we target fat mass loss during pregnancy in women with obesity?
#WomensHealth