Maternal Nutrition Before, During, and After Pregnancy: Update on What to Eat During the Childbearing Years

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Preconception Care: Get Ready to Get Pregnant
Recommendations to Improve Preconception Health and Health Care, 2005

• Details the goals of preconception care for women in their childbearing years (15 to 44 yrs.)

• Recommends:
  – Screening for health risks, such as iron deficiency, diabetes, and overweight
  – Health promotion and education
  – Implementing interventions that address the identified risks to mom and to pregnancy outcome

http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5506a1.htm
Act Like You’re Pregnant

• Nearly 50% of pregnancies in US are unexpected or mistimed

• The embryo is highly susceptible to birth defects and other problems during the first 10 weeks of development

• Women with unintended pregnancies are less likely to seek early prenatal care

http://www.cdc.gov/reproductivehealth/unintendedpregnancy/
Pre-pregnancy Planning

• Address existing chronic conditions, such as diabetes, overweight or obesity, HTN, anemia, etc.

• If there’s a history of LBW baby, pre-term delivery, birth defect, or infant death: seek medical advice prior to conceiving
Women of Childbearing Age:
Overweight and Undernourished
Body Weight and Women of Childbearing Age

- ~60% of women of CB age are overweight
- Obesity is more prevalent among women of lower socioeconomic status and of color who often times lack health insurance.

Prevalence of Obesity in U.S. Women

Obesity = BMI of 30 and above

• 20-39 years: 32%
• 40-59 years: 36%

Future Shot:
• 12-19 years: 17%

http://www.cdc.gov/obesity/data/adult.html
Pregravid Body Weight and Pregnancy Outcome

• Maternal pregravid BMI has a stronger relationship with fetal adiposity than GWG and GDM

• Maternal obesity before pregnancy and excessive weight gain during pregnancy are deleterious for mother and fetus and a “cause for public health concern.”

-2010 Dietary Guidelines for Americans

Consequences of Excess Pregravid Body Weight

- May reduce fertility and chances of conception, even with ART
- Increases risk for cesarean delivery, gestational DM, HTN, and preeclampsia
- Obesity increases the risk of structural defects, heart defects, and hypospadias; linked to lower breastfeeding initiation and duration
- Increases the risk of post-partum weight retention in mom
- Obese moms have children with a greater risk for obesity, diabetes, HTN vs. the children of non-obese moms

Hyperglycemia and Pregnancy Outcomes

- Elevated BG in first trimester increases the risk of birth defects and miscarriage.
- An estimated 80 million Americans have pre-diabetes:
  - A1C of 5.7% – 6.4%
  - Fasting blood glucose of 100 – 125 mg/dl
  - OGTT 2 hour blood glucose of 140 mg/dl – 199 mg/dl
- Pre-diabetes often predicts GDM and post-pregnancy type 2 DM; screen women before pregnancy, and if GDM, after, too

Weight Gain During Pregnancy: Reexamining the Guidelines

Institute of Medicine, 2009
Criteria for Classifications of Pre-pregnancy Weight Status

<table>
<thead>
<tr>
<th>Classification</th>
<th>Body Mass Index (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
</tr>
<tr>
<td>Normal</td>
<td>18.5-24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0-29.9</td>
</tr>
<tr>
<td>Obese</td>
<td>≥30</td>
</tr>
</tbody>
</table>

## Recommended Weight Gain for Pregnant Women (in pounds)

<table>
<thead>
<tr>
<th>Pre-pregnancy BMI (kg/m²)</th>
<th>Recommended Weight Gain (singleton)</th>
<th>Recommended Weight Gain (twins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.5</td>
<td>28 to 40</td>
<td>N/A*</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>25 to 35</td>
<td>37 to 54</td>
</tr>
<tr>
<td>25.0-29.9</td>
<td>15 to 25</td>
<td>31 to 50</td>
</tr>
<tr>
<td>≥30</td>
<td>11 to 20</td>
<td>25 to 42</td>
</tr>
</tbody>
</table>

* No guidelines were established based on lack of sufficient data.

Why the Need for Pregnancy Weight Gain Guidelines?

• Rising obesity rates in women since last edition (1990)

• Strength of evidence linking gestational weight gain (GWG) with certain outcomes for mother and child

Health Effects of Excess Gestational Weight Gain

• Post-partum weight retention
  – Regardless of pre-pregnancy BMI, gaining above the recommended ranges is associated with excess maternal weight retention at 1 year post-partum

• Higher cesarean delivery rates

Not enough evidence for:

• Gestational Diabetes Mellitus (GDM)
• Preeclampsia/hypertension in pregnancy

Cesarean Delivery

- 31.3%: Preliminary cesarean delivery rate among singleton births
- Maternal obesity is a risk factor for cesarean delivery

GWG and Obesity

• Guidelines for weight gain are based primarily on data for women with BMI of 30 - 34.9

• Women with higher BMIs should gain in lower end of weight gain ranges.

Pre-pregnancy Overweight Is Costly

- A higher-than-normal BMI associated with significantly more:
  - prenatal fetal tests
  - obstetrical ultrasound
  - medications dispensed from the outpatient pharmacy
  - telephone calls to the department of obstetrics and gynecology
  - prenatal visits with physicians
  - Increased length of stay related to increased rates of cesarean delivery and obesity-related high-risk conditions.

Calorie Needs in Pregnancy

• T1: 0 calories
• T2: 340 calories/day more than pre-pregnancy needs
• T3: 450 calories/day more than pre-pregnancy needs
• Energy intake increase to a smaller extent than other nutrient requirements, so nearly all food choices should be nutrient-dense.

Consequences of GWG for Child

• Inadequate weight gain:
  SGA (<10% weight for gestational age)

• Excessive weight gain:
  LGA (>90% weight for gestational age)

Childhood obesity

Intentions of IOM guidelines

• The reproductive cycle begins **before** conception and continues through the **first year** postpartum.

• Maternal weight status throughout the cycle influences the health of mother and child.

• **Conceive** at a healthy weight and gain accordingly, which will require **(pre-pregnancy) weight loss** for many women.

• Provide dietary assessment early in pregnancy with a referral to an RD, if needed.
Healthy Eating During the Childbearing Years
Bridging Nutrient Gaps
Nutrients of Concern in the U.S. Diet

- Calcium
- Vitamin D
- Potassium
- Fiber

http://www.cnpp.usda.gov/dietaryguidelines.htm
Other Nutrients of Concern In Women of U.S. Women of Childbearing Age

- Folic acid
- Iron

http://www.cnpp.usda.gov/dietaryguidelines.htm

Nutrients that tend to be underconsumed:
- Choline
- Docosahexaenoic Acid (DHA)
Iron

- Hemoglobin production, oxygen transport, fetal immunity, energy production, CNS development

- Iron stores at conception are a strong indicator for iron-deficiency anemia later in pregnancy; serum ferritin best reflects iron stores

- 9% of women of CB age have iron-deficiency or iron-deficiency anemia

- CDC: 30 mg elemental iron/day to prevent anemia during pregnancy and 60 to 120 mg/day to treat

http://www.cdc.gov/mmwr/preview/mmwrhtml/00051880.htm; http://www.cdc.gov/nchs/fastats/anemia.htm
Folic Acid

• Helps prevent neural tube defects (NTD) during first month; linked to lower risk for preterm birth, fetal growth restriction and LBW later in pregnancy

• Women in the CB years capable of becoming pregnant: 400 - 800 ug/day of folic acid

• Pregnancy: 600 ug/day

http://www.uspreventiveservicestaskforce.org/uspstf09/folicacid/folicacidrs.htm
Choline

- Essential nutrient; has a recommended daily intake
- Associated with a lower risk for NTD in population studies
- Necessary for CNS development and support (particularly the hippocampus, or memory center); acetylcholine production; muscle control; liver function

Choline Requirements

- Women: 425 mg/day
- Pregnant: 450 mg/day
- Nursing: 550 mg/day
- Many in the U.S. do not meet their choline needs.

Common choline sources

- Egg yolk, large: 125 mg
- Cooked ground beef, 3 ounces: 83 mg
- Cooked chicken, 3 ounces: 65 mg
- Cooked salmon, 3 ounces: 65 mg
- Cooked broccoli or cauliflower, 1 1/4 cup: 40 mg

www.nal.usda.gov/fnic/foodcomp/search/
Docosahexaenoic Acid (DHA)

• Dominant fatty acid in brain cells

• Comprises up to 50% of the total FA in phospholipids of the retina

• DHA demands increase especially when the fetal brain and nervous system rapidly accumulate DHA during the last trimester

Docosahexaenoic Acid (DHA)

- Pregnant and nursing women need at least 200 mg/day of DHA for baby’s brain and retina development

- DHA intake by pregnant women in industrialized countries varies: Mean 70 to 200 mg/day; median intake (30-50 mg/day)

DHA Sources

• Fish and shellfish are rich sources of preformed DHA, which gets preferential transport across the placenta and is most readily available in breast milk

• Dietary alpha-linolenic acid (ALA) is converted to DHA, but rate is low: 1% to 10%

Selected Sources of DHA (mg)

- Salmon, coho, farmed, 3 oz cooked: 740
- Expecta supplements (algal oil), 1 pill: 200
- Blue crab, 3 oz, cooked: 196
- Tuna, light, canned, drained, 3 oz: 190
- Chicken, roasted, dark meat, 1 cup: 70
- Fortified eggs, 1 large: 57-150
- Fortified cheese, 1 oz: 32
- Fortified soy beverages, milk, yogurt, 8 oz: 32

Manufacturer data: www.nal.usda.gov/fnic/foodcomp/search/
2010 Dietary Guidelines for Americans

- Women advised to eat 8-12 ounces of safe seafood every week when pregnant and breastfeeding

- “Safe” is considered relatively low in mercury

www.cnpp.usda.gov/dietaryguidelines.htm
Seafood: What’s Safe to Eat?

- AVOID these fish:
  - tilefish
  - shark
  - swordfish
  - king mackerel

Shrimp, canned light tuna, salmon, pollock and catfish are among the lowest in mercury.
# Seafood: What’s Safe to Eat?*

<table>
<thead>
<tr>
<th>Seafood, 4 ounces, cooked</th>
<th>Mercury (mcg)</th>
<th>EPA + DHA (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrimp</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Clams</td>
<td>0</td>
<td>200-300</td>
</tr>
<tr>
<td>Tilapia</td>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>Salmon: Atlantic, Chinook, Coho</td>
<td>2</td>
<td>1,200-2,400</td>
</tr>
<tr>
<td>Salmon: Pink and Sockeye</td>
<td>2</td>
<td>700-900</td>
</tr>
<tr>
<td>Sardines: Atlantic and Pacific</td>
<td>2</td>
<td>1,100-1,600</td>
</tr>
<tr>
<td>Haddock and Hake</td>
<td>2-5</td>
<td>20</td>
</tr>
<tr>
<td>Tuna, light canned</td>
<td>13</td>
<td>150-300</td>
</tr>
<tr>
<td><strong>Tuna: White (Albacore) canned</strong></td>
<td><strong>40</strong></td>
<td><strong>1,000</strong></td>
</tr>
<tr>
<td>Lobsters: Northern, American</td>
<td>47</td>
<td>200</td>
</tr>
<tr>
<td>Mackerel: King*</td>
<td>110</td>
<td>450</td>
</tr>
<tr>
<td>Swordfish*</td>
<td>147</td>
<td>100</td>
</tr>
<tr>
<td>Shark*</td>
<td>151</td>
<td>1250</td>
</tr>
<tr>
<td>Tilefish*</td>
<td>219</td>
<td>1000</td>
</tr>
</tbody>
</table>

(www.cnpp.usda.gov/dietaryguidelines.htm)
DHA and Pregnancy Outcomes

• Supplementation (seafood, fish oil, or single cell oils) linked to:
  – Longer gestation
  – Slightly higher birth weight


- Possible improvement in infant visual acuity, cognitive development, immunity

Vitamin D

• ALL women under 50 yrs: 600 IU/day

• Upper Limit: 4,000 IU/day

• Maternal vitamin D status (measure 25-OH-D) largely determines vitamin D status of the fetus and newborn

Wagner, CL, Greer, FR. Ped 1998;122:1142-1152
Vitamin D

• Many women in the northern part of the U.S., especially those of color, are at risk for vitamin D deficiency

• Overweight women are at greater risk for mid-pregnancy vitamin D deficiency

Bodnar et al. J Nutr 2007;137(2), 447-452
Maternal Vitamin D Insufficiency Linked To:

- Intrauterine growth restriction
- Recurrent wheeze
- Reduced bone mineral accrual
- Disorders of calcium metabolism in mother and child

Food Sources of Vitamin D (IU)

- Salmon (sockeye), cooked, 3 ounces: 447
- Mackerel, cooked, 3 ounces: 338
- Tuna, canned in water, drained, 3 ounces: 154
- Eggland’s Best egg, 1 large: 120
- Milk, any fat level, vitamin D-fortified, 1 cup: 115-124
- Orange juice, vitamin D-fortified: 100
- Yogurt, fortified, 6 ounces: 80
- Egg, 1 large: 40

www.nal.usda.gov/fnic/foodcomp/search/
Multivitamins

- Low-risk, relatively low-cost, with big rewards

- Meta-analysis of 41 studies suggests a link between MV and reduced NTD, heart and limb defects, and cleft palate

Supplement Savvy

• Look for:
  – About 100% - 150% of the Daily Value (DV), including folic acid, iron, and vitamin D
  
  – Less than 3,000 International Units (IU) of vitamin A; majority as beta-carotene
  
  – Other vitamins and minerals in Belly Bars, Omama! Bars, other fortified foods
  
  – Consider extra calcium, vitamin D, DHA
Exercise Guidelines

What’s New for Women in the Childbearing Years?
2008 Physical Activity Guidelines for Americans

- Healthy women: At least **150 minutes** (2 hours and 30 minutes) per week (ex. five 30-minute walks) of moderate-intensity aerobic activity, such as brisk walking, during and after their pregnancy, spread throughout the week.

- Healthy women who already do vigorous-intensity aerobic activity, such as running, or large amounts of activity can continue doing so during and after their pregnancy provided they stay healthy and discuss with their health care provider how and when activity should be adjusted over time.

[www.cdc.gov/physicalactivity/everyone/guidelines/pregnancy.html](http://www.cdc.gov/physicalactivity/everyone/guidelines/pregnancy.html)
Exercise During Pregnancy

- Improves chances of gaining within the IOM’s guidelines
- Helps prevent GDM
- Improves mood and energy level
- Lessens constipation
- Improves sleep
Do Not Do This During Pregnancy

- Skydiving
- Surfing
- Kickboxing
- Scuba diving
- Downhill skiing or snowboarding
- Waterskiing
- Horseback riding
- Skateboarding
- Roller and ice skating
- Contact sports (football, hockey, etc.)
- Gymnastics
- Mountain climbing
Alcohol and Caffeine
Considering Caffeine

- Observational studies link caffeine to miscarriage, growth restriction, LBW, pre-term birth, stillbirth
- Yet, insufficient evidence from randomized controlled trials to support benefits of avoiding caffeine during pregnancy
- Best to err on side of caution: March of Dimes limit caffeine to 200 mg/day during pregnancy

www.marchofdimes.com/professionals/14322_1148.asp
Common caffeine sources

- Starbucks coffee, 16 oz: 330 mg
- Einstein Bros coffee, 16 oz: 300 mg
- Foosh Energy Mints, 1: 100 mg
- Red Bull, 8.3 oz: 75 mg
- Mountain Dew, 12 oz: 71 mg
- Diet Coke, Coke, 12 oz: ~50 mg
- Tea, 8 oz: 47 mg

Herbal Supplements

• Very few scientific studies regarding the safety of herbs during pregnancy.

• Herbal teas are caffeine-free.

• Most likely, supermarket herbal teas are safe in moderation.

• Natural Medicines Database:
Alcohol: Is Any Amount Safe?

- Moderate drinking (1/day) may lengthen time to conception
  (one drink: 12 oz regular beer; 5 oz wine; 1 1/2 oz 80-proof distilled spirits)

- No alcohol during pregnancy and when trying for a baby

http://health.nih.gov/topic/FetalAlcoholSyndrome
Alcohol Consumption: The Reality

• 1 in 12 women drink during pregnancy.

• About 1 in 30 binge drink (5 or more drinks) on any one occasion.


Alcohol and Pregnancy Don’t Mix:

- Up to 40,000 babies born with Fetal Alcohol Spectrum Disorders (FASD) each year.
- Fetal Alcohol Syndrome (FAS): leading cause of mental retardation in the U.S.
- Learning disabilities
- Birth defects
- Behavioral problems
- Emotional problems


The Fourth Trimester

Recovering, Breastfeeding, and Preparing for the Next Child
Nutrient Needs of Nursing Moms

- Calories: 330/day for first 6 months; 400/day for 6-12 months
- Fluid: minimum of 13 8-ounce glasses/day
- DHA: 200-300 mg/day
- Daily multivitamin to cover nutrient needs + balanced diet with adequate choline and DHA; supplemental vitamin D and DHA
Post-partum Weight Loss

• No severe calorie restriction for at least 6 weeks post-delivery (Nursing moms, no less than 1,800 calories/day.)

• OK to exercise, if exercise is considered OK

• Give your body time to recover; can take up to a year to return to “normal”
Future Mom’s To-Do List:

• Get a check-up that includes blood work; see that vaccinations are up-to-date.
• Achieve a healthy weight on a balanced diet.
• Include regular exercise.
• Avoid excess alcohol and caffeine.
• Take a daily multivitamin.
• Stop smoking.
• See your dentist.
• Check all OTC and prescription medications for use during pregnancy.
Summary

Thank you!