Chapter 11: Nutrition During Pregnancy and Infancy

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Student learning outcomes: At the end of this chapter, you should be able to:

- Compare and contrast nutrition during pregnancy, lactation, and infancy vs. recommendations for healthy adults
- Plan a diet to meet recommendations during pregnancy, lactation, and infancy

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Fetal development

- Fertilization: sperm and egg fuse to form a single cell
- Cells divide and differentiate (specialize) for 40 weeks of gestation
- About a week after fertilization, the embryo implants in the lining of the uterus
- After nine weeks, the developing baby is called a fetus

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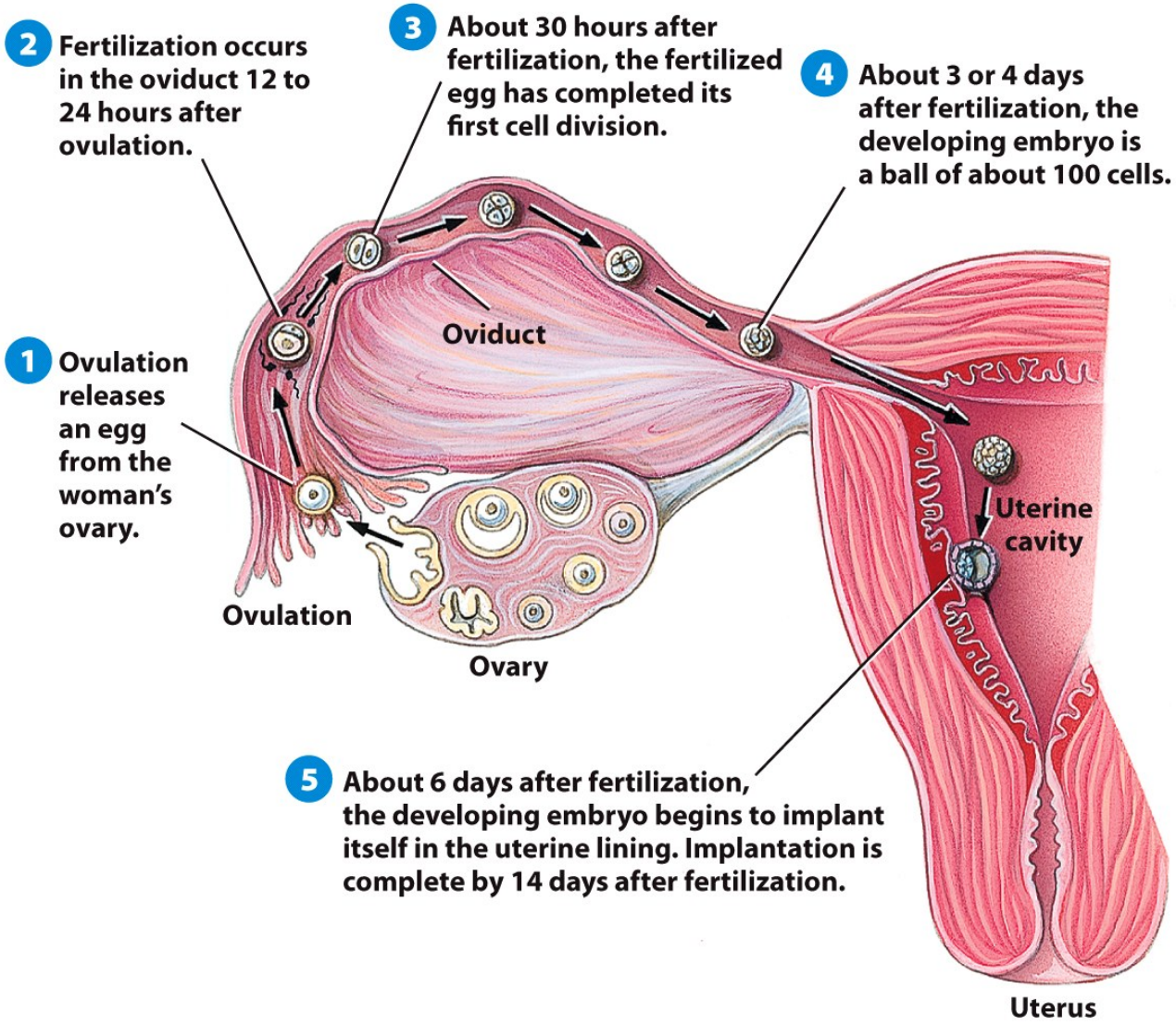
Fetal development



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Fetal development

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Fetal nourishment

- Weeks 2–5: embryo is nourished from uterine lining
- After week 5: placenta nourishes embryo/fetus
  - Organ produced from maternal and fetal tissue
  - Secretes hormones
  - Transfers nutrients and oxygen from the mother's blood to the embryo/fetus
  - Removes metabolic wastes

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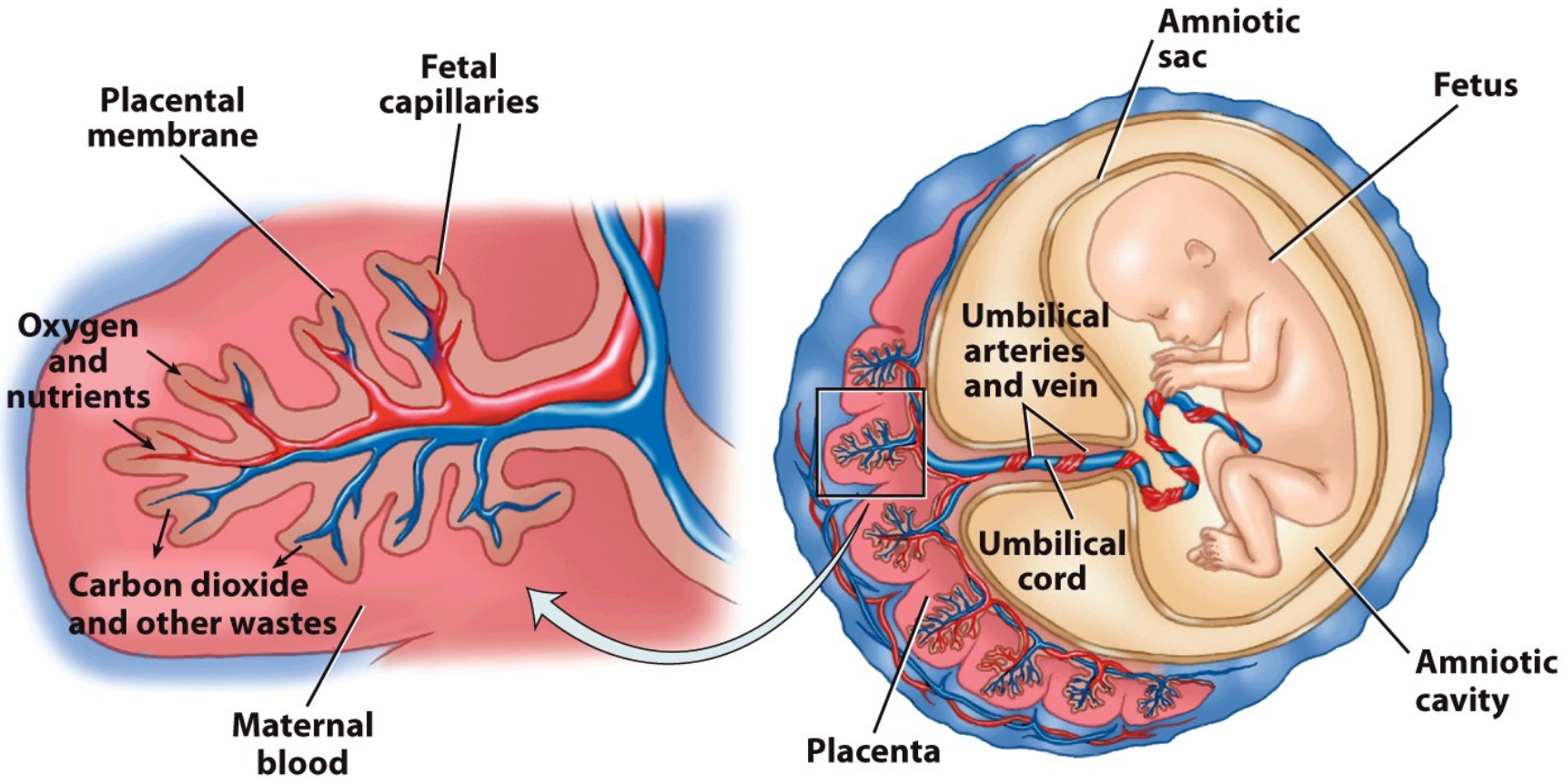
Fetal nourishment



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Birth weight

- Full-term infants are usually born at 40 weeks and weigh 3–4 kilograms (6.5–9 pounds)
- Small for gestational age: born on time but failed to grow well in the uterus
- Large for gestational age: > 4 kg (8.8 lbs)
- Low-birth weight infants: < 2.5 kg (5.5 lbs)
- Very-low-birth weight infants: <1.5 kg (3.3 lbs)
- Premature or preterm: born before 37 weeks

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Low-birth-weight infants

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Weight gain during pregnancy

- Blood volume increases by 50%
- Placenta develops to nourish the fetus / embryo
- Amount of body fat increases to provide energy needed late in pregnancy
- Uterus enlarges and muscles and ligaments relax to accommodate the growing fetus and allow for childbirth
- Breasts develop in preparation for lactation (milk production and secretion)

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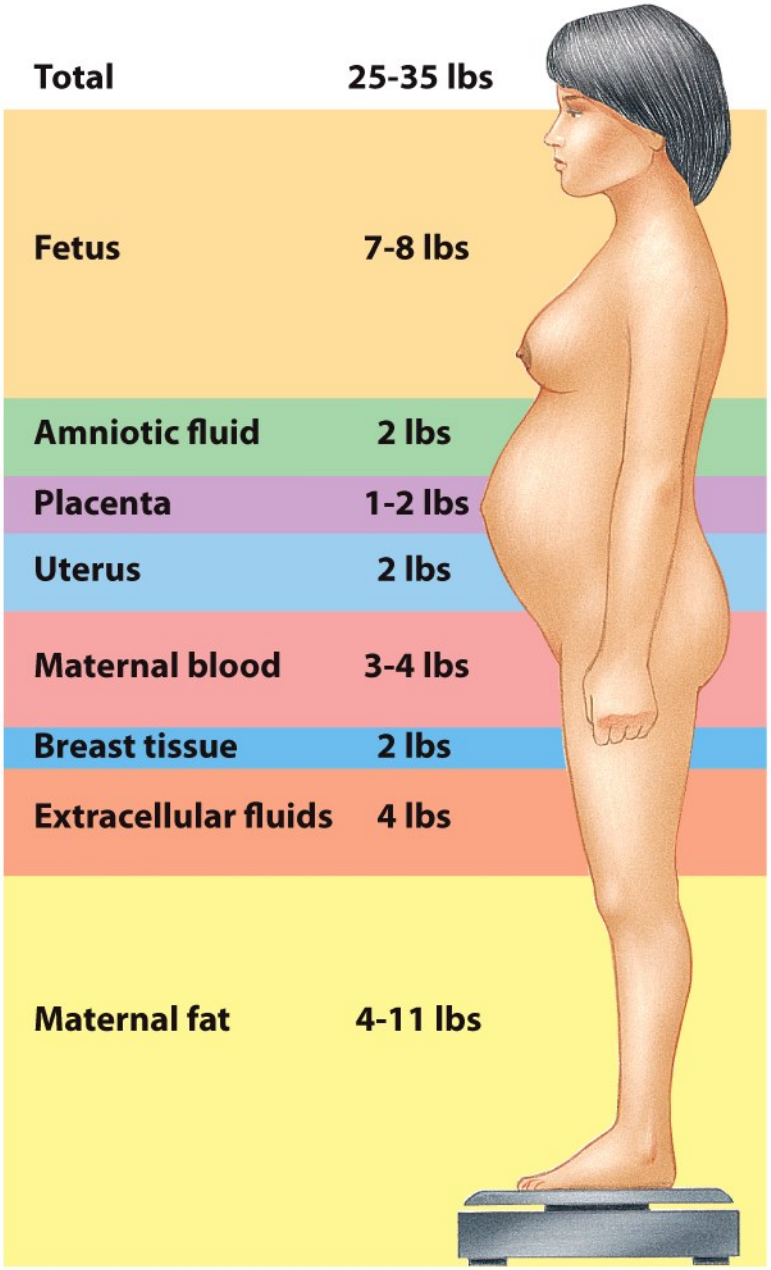
Weight gain during pregnancy



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Weight gain during pregnancy

- Healthy, normal-weight woman should gain 11–16 kg (25–35 lbs) during pregnancy
  - Rate of weight gain is as important as amount
  - Little gain is expected in the first 3 months (1st trimester), usually about 1–2 kg (2–4 lbs)
  - In the 2nd and 3rd trimesters, the recommended maternal weight gain is about 0.5 kg (1 lb)/week.
  - Women who are underweight or overweight/obese at conception should gain more or less weight, respectively, at a slow, steady rate

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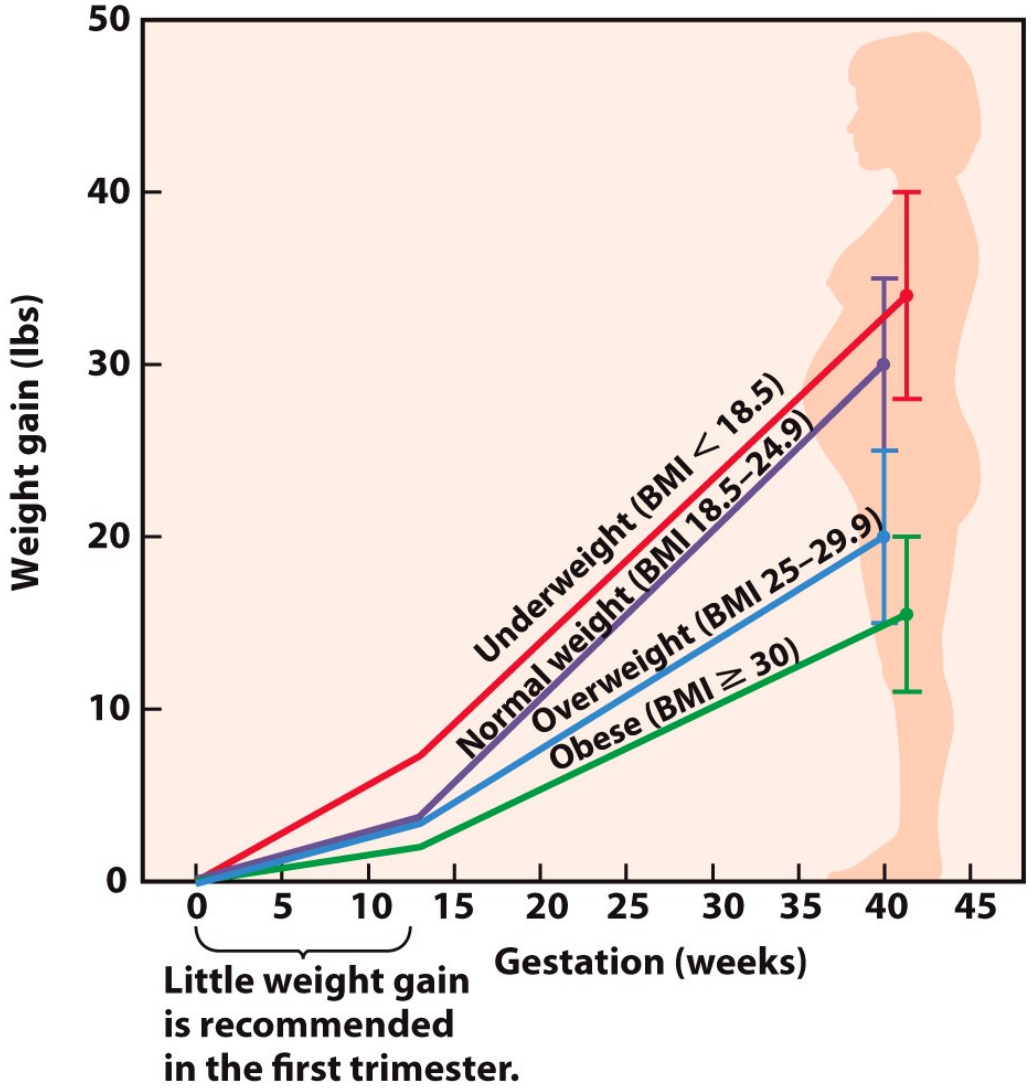
Weight gain during pregnancy



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Underweight during pregnancy

- Being underweight by 10% or more at the onset of pregnancy
- or gaining too little weight during pregnancy
- increases the risk of producing a low-birth-weight baby

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Overweight during pregnancy

- Excess weight before conception or gained during pregnancy *increases mother's risks for high blood pressure, diabetes, a difficult delivery*
- need for a cesarean section, and having a large-for-gestational-age baby
- Excessive prenatal weight gain increases the mother's long-term risk for obesity
- may increase the risk that the child will be overweight

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Overweight during pregnancy

- Dieting during pregnancy is not advised
- Excess weight should be lost before pregnancy begins
- or after birth and weaning

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Physical activity during pregnancy can:

- Interfere with balance and put stress on bones, joints, and muscles, increasing the risk of exercise-related injury
- Improve digestion
- Prevent excess weight gain, low back pain, and constipation
- Reduce risk of diabetes and high blood pressure
- Speed recovery from childbirth

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Physical activity during pregnancy

- Guidelines to maximize benefits and minimize risks of injury to mother and fetus
  - Women who were physically active before pregnancy can continue a program of about 30 minutes of carefully chosen moderate exercise per day
  - Women who weren't active before pregnancy should slowly add low-intensity, low-impact activities
  - Because intense exercise can limit the delivery of oxygen and nutrients to the fetus, *intense exercise should be limited*

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Physical activity during pregnancy

Guidelines for physical activity during pregnancy Table 11.1

Do . . .	Don't . . .
Obtain permission from your health care provider before beginning an exercise program.	Exercise strenuously during the first trimester.
Increase activity gradually if you were inactive before pregnancy.	Exercise strenuously for more than 15 minutes at a time during the second and third trimesters.
Exercise regularly rather than intermittently.	Exercise to the point of exhaustion.
Stop exercising when fatigued.	Exercise lying on your back after the first trimester.
Choose non-weight-bearing activities, such as swimming, that entail minimal risk of falls or abdominal injury.	Scuba dive or engage in activities that entail risk of abdominal trauma, falls, or joint stress.
Drink plenty of fluids before, during, and after exercise.	Exercise in hot or humid environments.

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Discomforts during pregnancy

- Edema: accumulation of fluid in tissues
- Morning sickness: nausea and vomiting any time of day or night, usually in 1st trimester // Eat small, frequent snacks of dry, starchy foods
- Heartburn // Limit high-fat foods; avoid heartburn-causing substances; eat small, frequent meals; remain upright after eating
- Constipation and hemorrhoids // Maintain moderate level of physical activity and consume plenty of fluids and high-fiber foods

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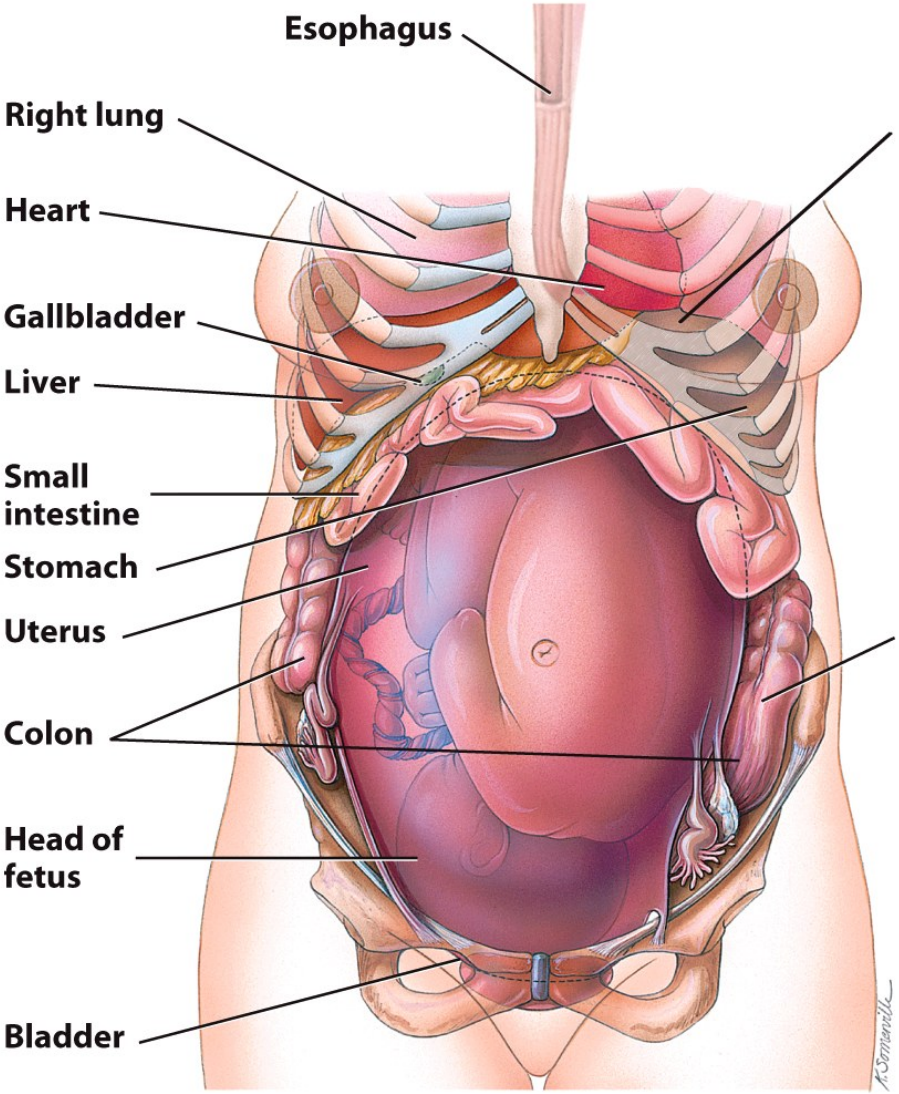
Discomforts during pregnancy



Heartburn is common during pregnancy because the sphincter relaxes, allowing acidic stomach contents to leak into the esophagus. Heartburn increases as pregnancy progresses because the enlarging uterus crowds the stomach.

Constipation is common during pregnancy because the relaxed muscles of the colon are less efficient. Constipation becomes more of a problem late in pregnancy, when the weight of the uterus puts pressure on the colon.

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Complications of pregnancy in the US

- 4.25 million women give birth every year
- About 12% of babies are premature
- 8% have low- or very-low-birth weights
- Almost 7 out of 1000 of those born alive die in their first year of life
- About 13 out of every 100,000 women die as a result of childbirth

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Hypertensive disorders of pregnancy

- Spectrum of conditions involving *elevated blood pressure during pregnancy*
- About 6–8% of US pregnant women experience high blood pressure
- Causes over 12% of US pregnancy-related maternal deaths
- Especially *common under 18 and over 35* years of age, in low-income mothers, and with chronic hypertension or kidney disease

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Hypertensive disorders of pregnancy

- Gestational hypertension: abnormal rise in blood pressure after the 20th week
- Pre-eclampsia (or toxemia): high blood pressure with edema and protein in urine; reduces blood flow to the placenta
  - Requires bed rest and careful medical monitoring; usually resolves after delivery
- Eclampsia: causes life-threatening seizures, coma and death

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Gestational diabetes

- High blood glucose levels that develops in a pregnant woman
- More common with obesity and family history of type 2 diabetes and in African Americans, Hispanic/Latino Americans, Native Americans
- Mother has a 20–50% chance of developing diabetes in 5–10 years
- Fetus is at risk for being large for gestational age and developing diabetes

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Pregnancy energy needs

- 1st trimester: energy needs not increased above nonpregnant levels
- 2nd trimester: additional 340 Calories/day
- 3rd trimester: additional 452 Calories/day

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Pregnancy macronutrient needs

- Protein: increased by 25 g, or 1.1 g/kg/day, for the 2nd and 3rd trimesters
- Carbohydrate: increased by 45 g, to 175 g/day
- Fiber: increased by 3 g of fiber/day
- Fat: increased essential fatty acids and long-chain polyunsaturated fatty acids
- Same distribution of calories from protein, carbohydrate, and fat

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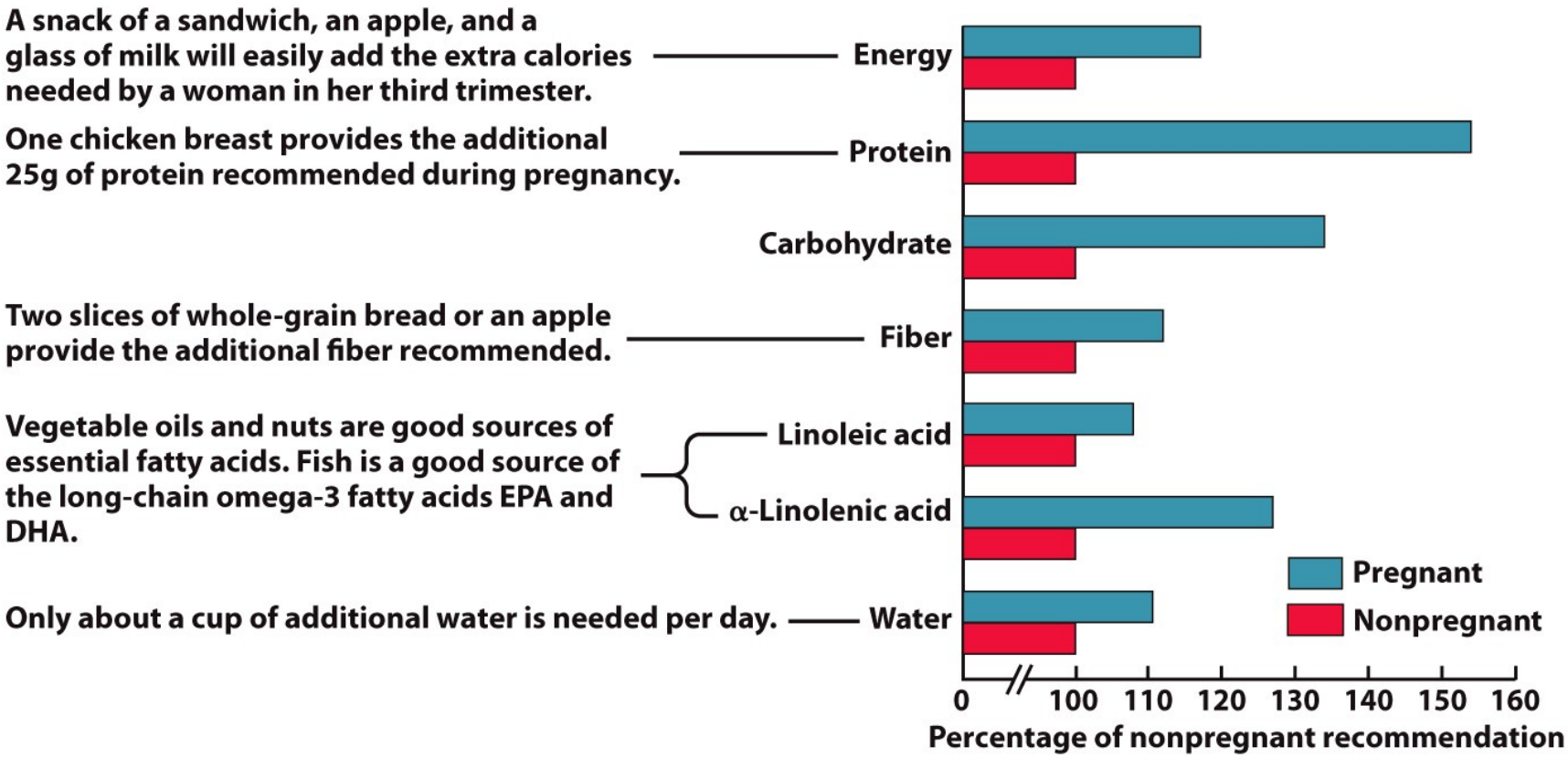
Increased pregnancy energy needs



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Pregnancy fluid & electrolyte needs

- Water: increased to 3 L/day during pregnancy /// from 2.7 L/day in nonpregnant women

- Electrolytes: no evidence that requirements for potassium, sodium, and chloride are different

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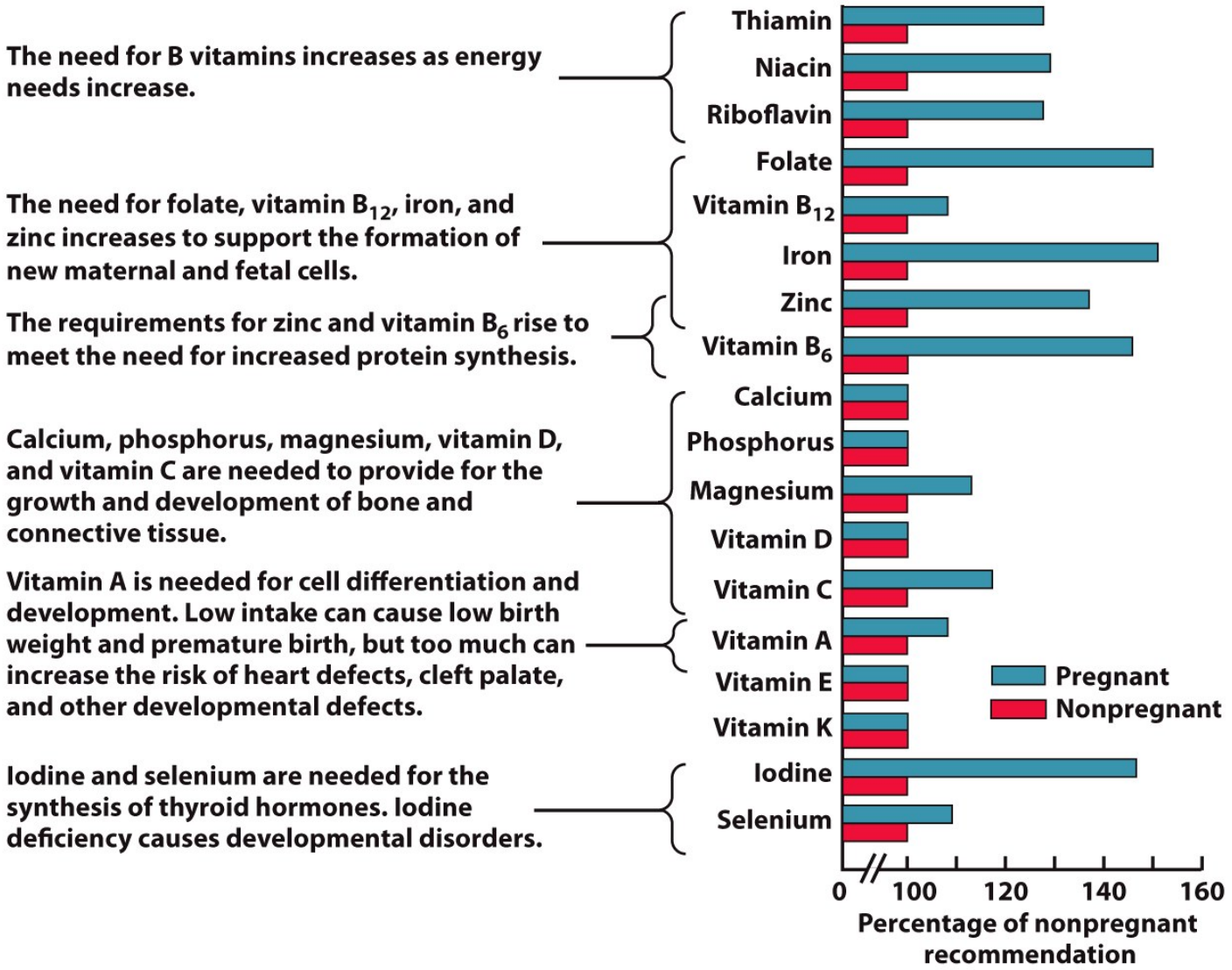
Pregnancy micronutrient needs



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Pregnancy vitamin & mineral needs

- Calcium: RDA not increased because calcium absorption doubles
  - For teeth and bones
  - From dairy, calcium-rich vegetables, fortified foods, supplements
  -
- Vitamin D: RDA not increased
  - For absorption of calcium
  - From fortified foods, supplements, sunlight

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Pregnancy vitamin & mineral needs

- Folate: RDA for all women capable of becoming pregnant is 600 µg of dietary folate equivalents per day
  - For synthesis of DNA and cell division
  - neural tube formation 21–28 days after conception
  - prevention of megaplastic anemia in the mother, premature births, and low birth weight
  - From supplements, fortified products, dark leafy greens, legumes, orange juice

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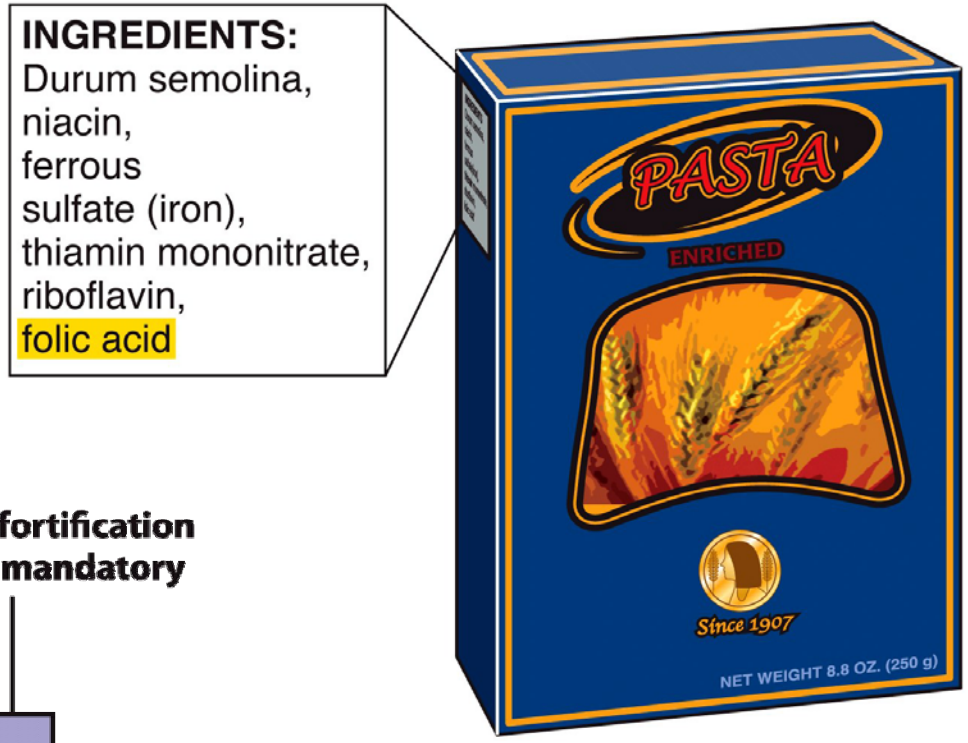
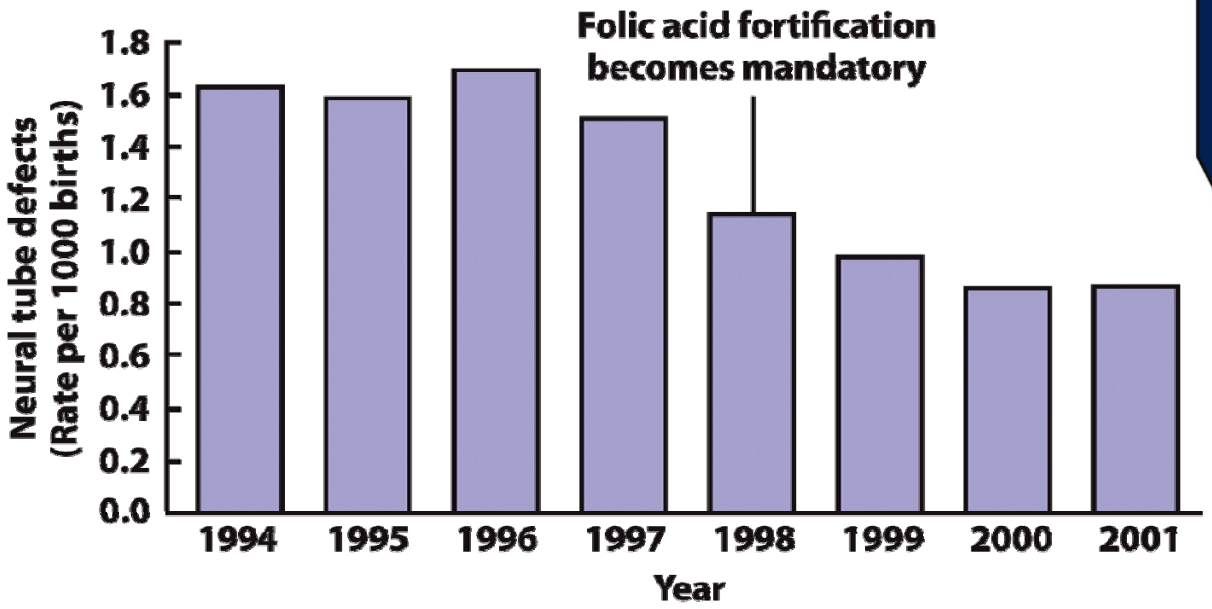
Folate fortification





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Pregnancy vitamin & mineral needs

- Vitamin B_{12} // RDA is 2.6 µg/day
  - For regeneration of active forms of folate, prevention of megablastic anemia
  - From animal products, fortified foods, supplements

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Pregnancy vitamin & mineral needs

- Iron: RDA is 27 mg/day (50% higher)
  - For synthesis of iron-containing proteins (hemoglobin), prevention of iron-deficiency anemia
  - From red meat, leafy greens, fortified foods, supplements

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Pregnancy vitamin & mineral needs

- Zinc: RDA is 13 mg/day (≤18); 11 mg/day (≥19)
  - For synthesis and function of DNA and RNA and synthesis of proteins, prevention of fetal malformations, premature birth, and low birth weight
  - Iron and zinc from red meat

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Food guide for pregnancy

	Grains Make half your grains whole	Vegetables Vary your veggies	Fruits Focus on fruits	Dairy Get your calcium-rich foods	Protein Choose lean with protein
1st Trimester	7 ounces	3 cups	2 cups	3 cups	6 ounces
2nd Trimester	8 ounces	3 cups	2 cups	3 cups	6 1/2 ounces
3rd Trimester	9 ounces	3 1/2 cups	2 cups	3 cups	6 1/2 ounces

choosemyplate.gov

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Prenatal supplements

Supplement Facts

Serving Size 1 Tablet
Servings Per Container 60

Amount Per 1 Tablet	% Daily Value
Vitamin A (as beta carotene) 5000 IU	63%
Vitamin C (as ascorbic acid) 85 mg	100%
Vitamin D (as cholecalciferol) 400 IU	200%
Vitamin E (as d-alpha tocopheryl acetate) 22 IU	67%
Vitamin K 90 mcg	100%
Thiamin 1.4 mg	100%
Riboflavin 1.6 mg	100%
Niacin (as niacinamide) 17 mg	100%
Vitamin B_6 (as pyridoxine HCl) 2.6 mg	137%
Folic acid 1000 mcg	167%
Vitamin B_{12} (as cyanocobalamin) 2.6 mg	100%
Pantothenic Acid (as as d-calcium pantothenate) 6 mg	100%
Iron (as iron fumarate) 27 mg	100%
Iodine (kelp) 220 mcg	100%
Zinc (as monomethionine & gluconate) 11mg	100%
Selenium (as sodium selenate) 60 mcg	100%
Copper (as copper sulfate) 1000 mcg	100%
Calcium (as calcium carbonate) 200 mg	20%

*** Daily Values based on RDAs for pregnant women ages 19-50**

Other ingredients: stearic acid, vegetable stearate, silicon dioxide, croscarmellose sodium, microcrystalline cellulose, natural coating (contains hydroxypropyl methylcellulose, titanium dioxide, riboflavin, polyethylene glycol and polysorbate)

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Food cravings & aversions

- Common cravings
  - Ice cream, sweets, candy, fruit, fish
  - Pica // craving for and ingestion of nonfood substances (clay, laundry starch, ashes) with little or no nutrition
- Common aversions
  - Coffee, highly seasoned foods, fried foods
- Unknown cause, *possibly hormonal or physiological* (for example, taste and smell changes), psychological, or behavioral changes

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Pica

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Increased risks during pregnancy

- The embryo and fetus are *vulnerable to damage* because cells are dividing rapidly, differentiating, and moving to form structures
- Developmental errors can be *caused by deficiencies or excesses in maternal diet* and by harmful substances in the environment, diet, medications, or recreational drugs
- Teratogen: agent that causes a birth defect during a critical period in development

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Increased risks during pregnancy

- Excesses or deficiencies of weight or nutrients can affect hormone levels and fertility
- During pregnancy, malnutrition can
  - cause fetal problems: growth retardation, low birth weight, birth defects, premature birth, spontaneous abortion, stillbirth
  - affect child's risk of developing chronic diseases: heart disease, high blood pressure, stroke, high blood cholesterol, diabetes, obesity, osteoporosis

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Dutch famine effects on pregnancy

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WIC program

- Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
- Federally-funded program
- Provides vouchers for the purchase of nutritious foods and referrals to health and other services for low-income women who *are pregnant, postpartum, or breast feeding, and for infants and children up to age 5 who are at risk of malnutrition*

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Teenage pregnancy

- Nutrient intake must meet their needs for growth and for pregnancy
- Increased risk of hypertensive disorders of pregnancy and delivering preterm and low-birth-weight babies
- May stop growing themselves

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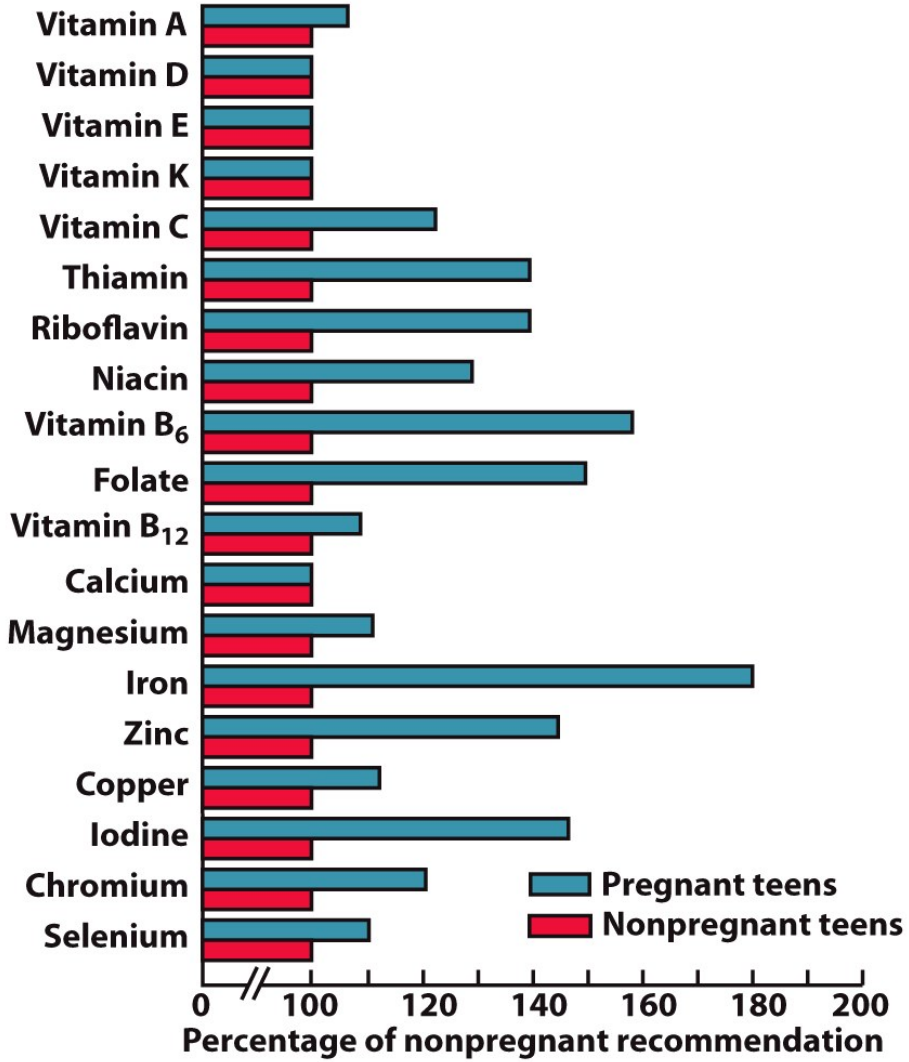
Teenage pregnancy



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Pregnancy over age 35

- More likely to
  - have preexisting conditions (cardiovascular disease, kidney disorders, obesity, or diabetes) which increase risks associated with pregnancy
  - develop *gestational diabetes, hypertensive disorders of pregnancy*, and other complications
  - have low-birth-weight infants and chromosomal abnormalities, especially Down syndrome
  - have twins and triplets with increased nutrient needs and preterm delivery

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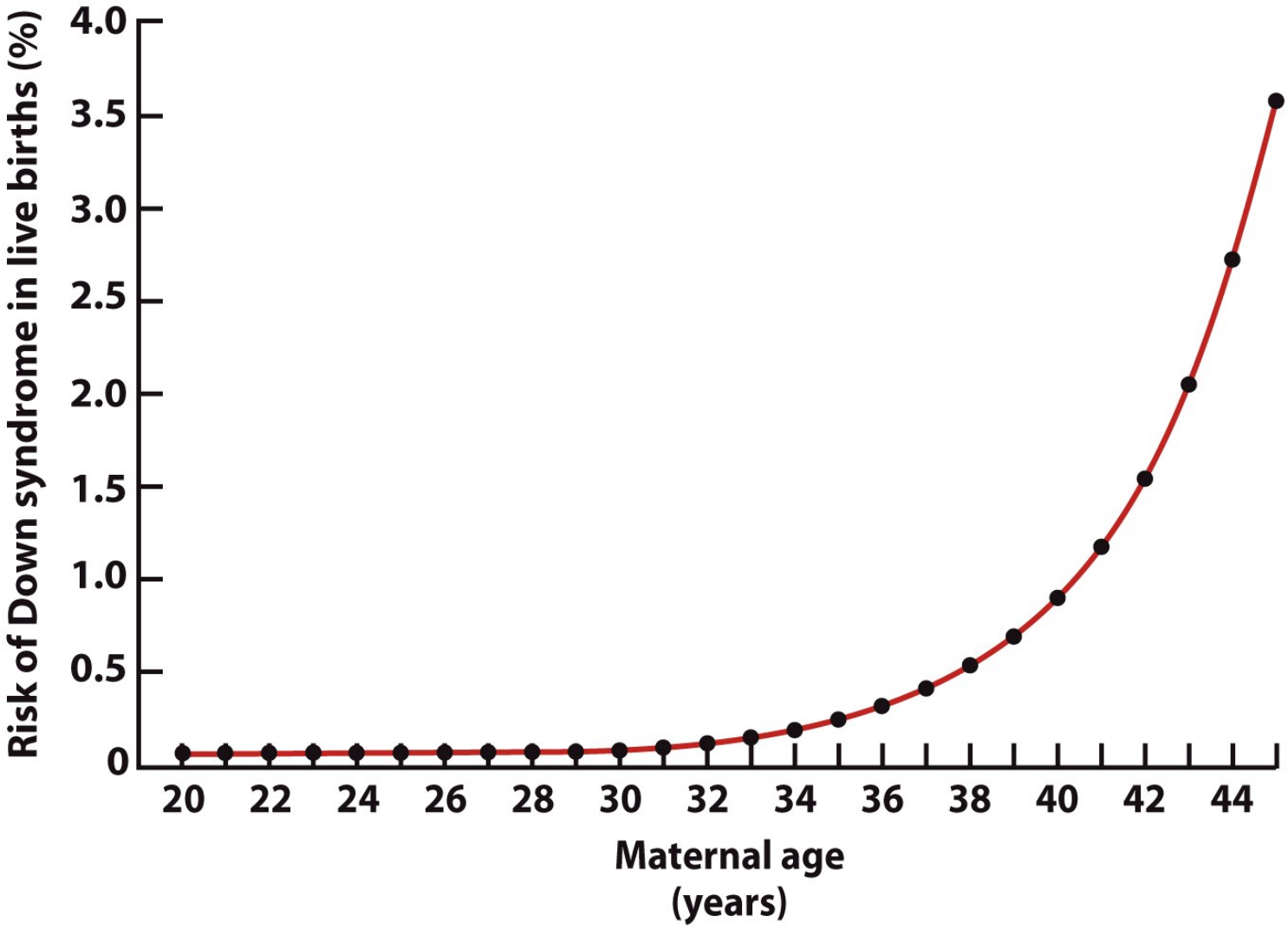
Down syndrome



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Increased risks during pregnancy

- A woman who has had
  - many miscarriages is more likely to have another
  - one child with a birth defect has increased risk for defects in subsequent pregnancies
  - <18 months between pregnancies has increased risk of delivering a small-for-gestational age infant
  - only 3 months between pregnancies has increased risk of a preterm infant and neonatal death

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Toxic substances during pregnancy

- Caffeine in excess associated with increased risk of miscarriage or low birth weight
  - Limit caffeine to <200 mg of caffeine/day (1-2 cups of coffee or 2–3 20-ounce soft drinks)
- Mercury in fish can cause developmental delays and brain damage
  - Consume 8–12 ounces of seafood/week from a variety of seafood types; avoid fish high in mercury; limit fish with lower amounts mercury
  - Source of lean protein, omega-3 fatty acids, iodine

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Food safety during pregnancy

Food safety during pregnancy[38] Table 11.2
Don't eat swordfish, shark, king mackerel, or tilefish, which can be high in mercury.
Eat up to 6 oz per week of canned albacore or chunk white tuna and up to 12 oz per week of fish and shellfish that are lower in mercury, such as salmon, shrimp, canned light tuna, pollock, catfish, and cod.
Check local advisories about the safety of fish caught in local waters. If no advice is available, eat up to 6 oz per week but don't consume any other fish during that week.
Don't drink raw (unpasteurized) milk or consume products made with unpasteurized milk, such as certain Mexican-style soft cheeses.
Don't eat refrigerated smoked fish, cold deli salads, or refrigerated pâtés or meat spreads.
Don't eat hot dogs unless they have been reheated to steaming hot.
Don't eat raw or undercooked meat, poultry, fish, shellfish, or eggs.
Don't eat unwashed fruits and vegetables, raw sprouts, or unpasteurized juice.

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Food-borne illness during pregnancy

- *Immune system weakened during pregnancy* /// increasing number and severity of infections
  - *Listeria* infections often result in miscarriage, premature delivery, stillbirth, or fetal infection; bacteria commonly found in unpasteurized milk, soft cheeses, and uncooked hot dogs and lunch meats
  - Toxoplasmosis infected babies can develop vision and hearing loss, intellectual disability, seizures; parasite found in cat feces, soil, and undercooked infected meat

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Alcohol during pregnancy

- A leading cause of preventable birth defects
- Teratogen that damages nervous system
- *Affects fetal growth and development* because it *reduces blood flow* to the placenta
- Can impair maternal nutritional status

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Alcohol during pregnancy

- Causes fetal alcohol spectrum disorders (FASD)
  - Physical or behavioral conditions and functional or mental impairments linked to prenatal alcohol exposure; includes fetal alcohol syndrome

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Alcohol during pregnancy

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Cigarettes during pregnancy

- Teratogens that damage nervous system
- *Reduces amount of oxygen* and nutrients delivered to fetus
- Reduces birth weight; increases risks of stillbirth, preterm delivery, neurobehavioral problems, respiratory problems, early infant death (sudden infant death syndrome, or SIDS)
- 2nd-hand smoke increases risk of having a low-birth-weight baby

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Drugs during pregnancy

- Discuss ALL medicines with doctor
- Marijuana and cocaine enter fetal blood
- Cocaine reduce delivery of oxygen and nutrients to the fetus
  - Increased risk of miscarriage, fetal growth retardation, premature labor and delivery, low birth weight, birth defects
  - Cocaine and other illegal drugs before birth affect infant behavior // childhood learning and attention span

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Lactation

- Synthesis of milk components // Stimulated by pituitary hormone prolactin
- Let down // release of milk from milk-producing glands and movement through the milk ducts to the nipple
  - Stimulated by pituitary hormone oxytocin
  - Inhibited by nervous tension, fatigue, or embarrassment

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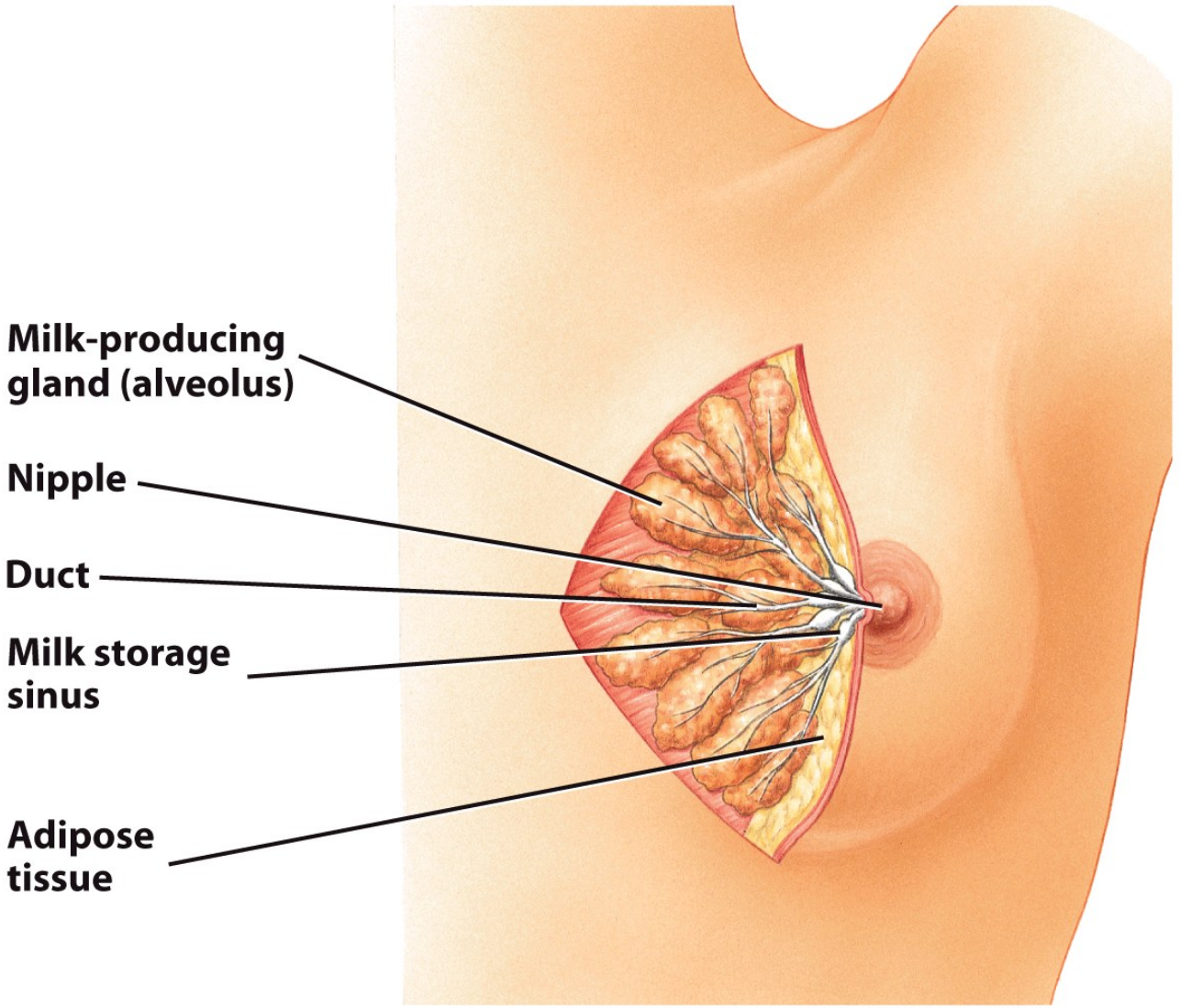
Lactation



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Nutrition during lactation

- 1st 6 months: additional 330 Calories/day
- 2nd 6 months: additional 400 Calories
- Protein: RDA increased by 25 g/day
- Higher intakes of total carbohydrate, fiber, essential fatty acids, several vitamins, minerals
- Water: additional 1 liter/day
- Some energy and nutrients from maternal stores

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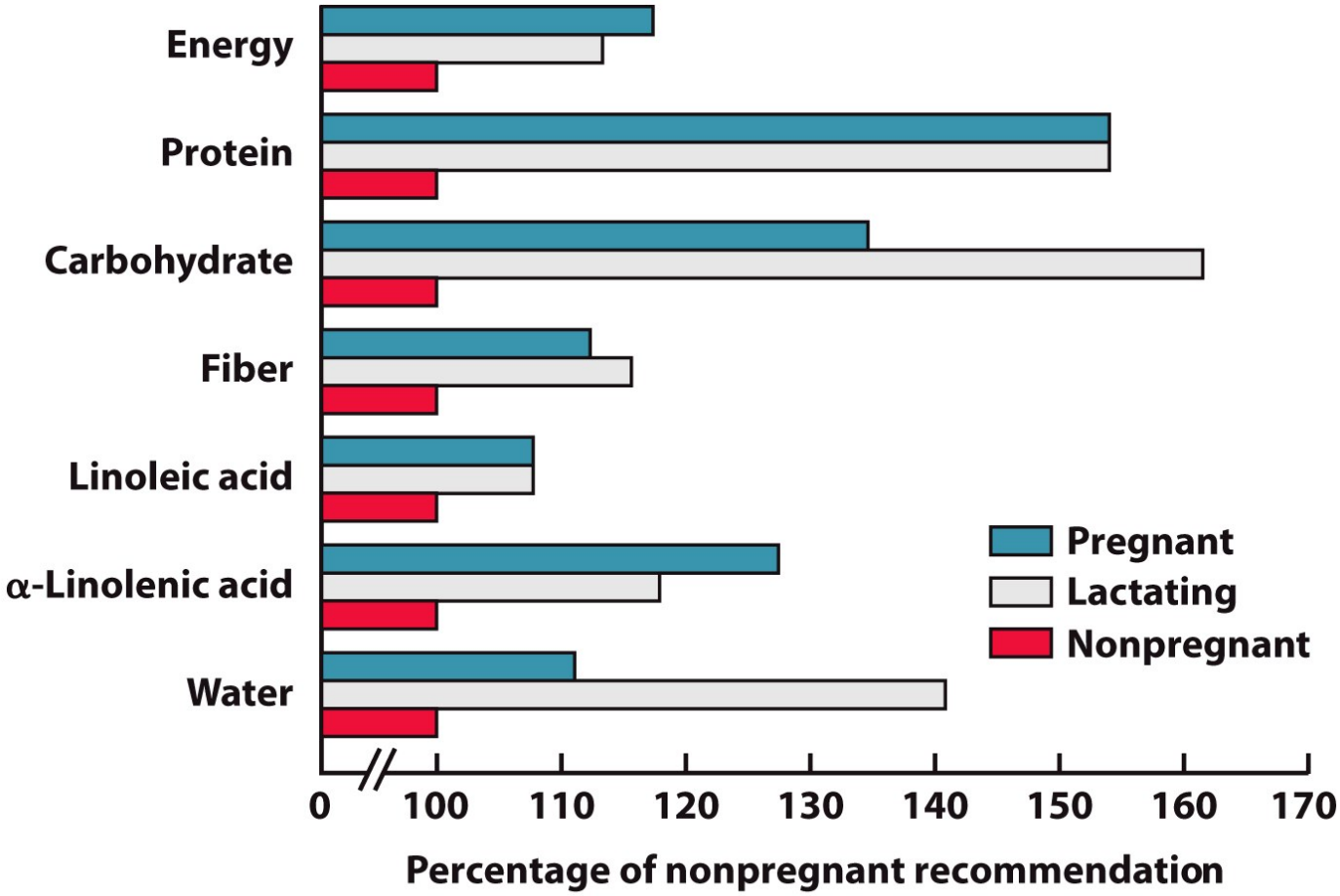
Lactation



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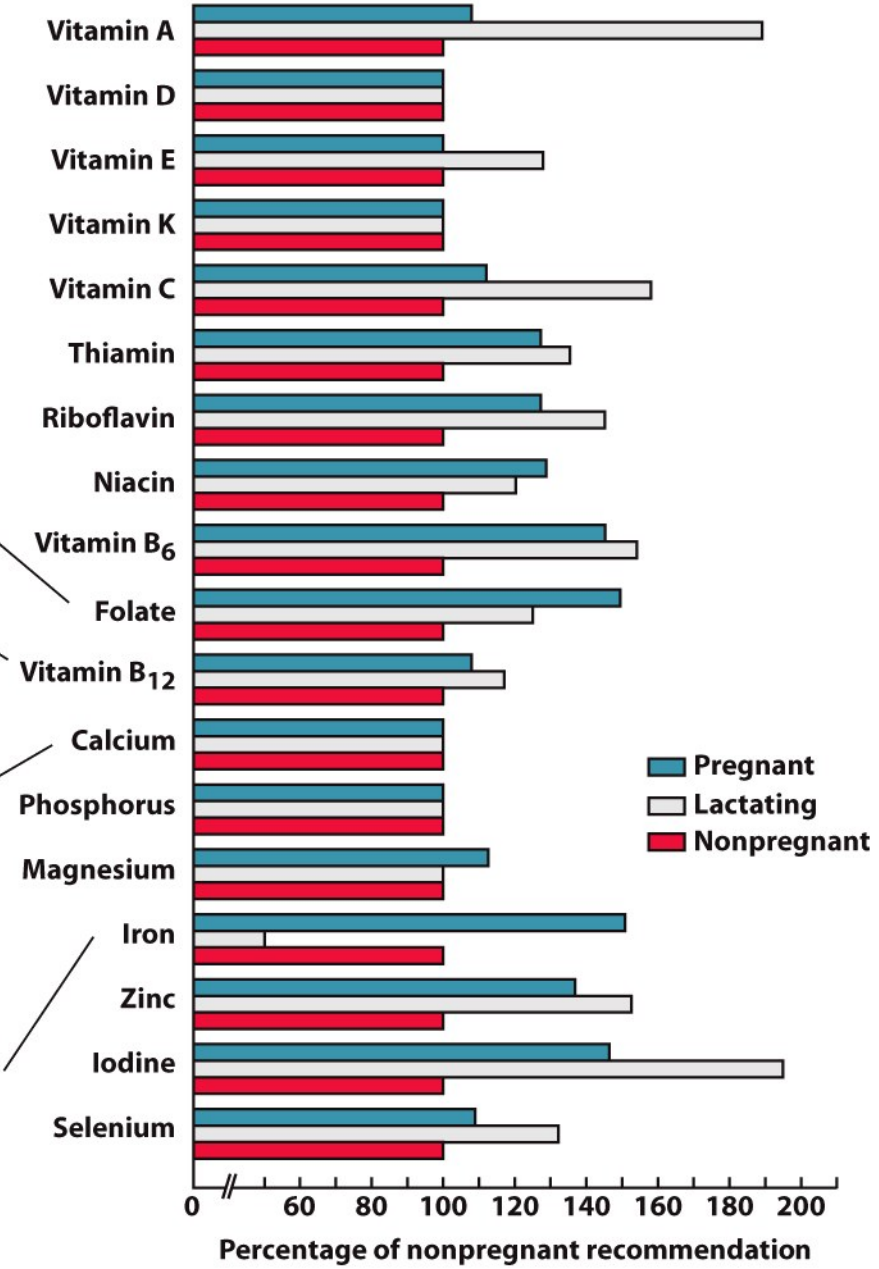
Lactation

Folate needs are increased during lactation because this micronutrient is secreted in milk.

Because vitamin B_{12} may be deficient in the breast milk of vegan mothers, their infants should be given a vitamin B_{12} supplement.[24]

Increasing calcium intake during lactation does not prevent loss of calcium from maternal bones. Calcium supplements during lactation also do not affect the concentration of calcium in the milk or the minerals in the mother's bones.[4] The calcium lost from bones is restored after weaning.

Iron needs are reduced during lactation because little iron is lost in milk; moreover, iron losses are decreased in most lactating women because menstruation, which ceases during pregnancy, has not resumed. The RDA for lactation is 9 mg/day, half that of nonpregnant, nonlactating women.[27]



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Infant growth

- Growth is the best indicator of adequate nutrition in an infant
  - Birth weight should double by 4 months and triple by 1 year
  - Most infants increase length by 50%
- Growth charts: compare weight, length, or head circumference to the population
  - Ranking, or percentile, indicates where the infant's growth falls in relation to population standards

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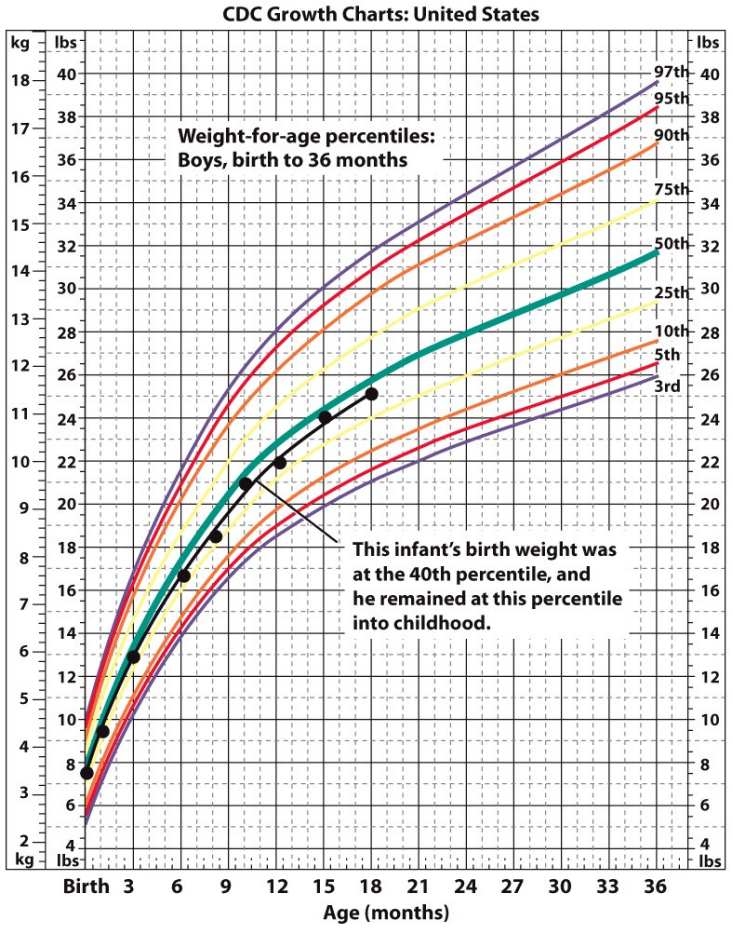
Growth charts

A 24 month-old boy who weighs 30 pounds is at the _____ percentile.

a) 25th
b) 50th
c) 75th
d) 90th



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Infant growth

- Not following the established growth curve or a sudden change in growth pattern could indicate overnutrition or undernutrition
  - Increases risks of obesity, diabetes, high blood pressure, harmful blood lipid levels, cardiovascular disease in adulthood
- Failure to thrive caused by biological or psychosocial problems
  - Can permanently affect growth, development, learning, behavior, health

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Infant nutrient needs

- Energy recommendations for 3 age groups /// 0 to 3 months, 4 to 6 months, and 7 to 12 months

- Nutrient recommendations for 2 age groups /// 0 to 6 months and 7 to 12 months

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Infant nutrient needs

- Require an energy-dense diet
  - 1st 6 months: about 55% of their energy as fat
  - 2nd 6 months: about 40% of their energy as fat
  - These percentages are far higher than the 20–35% of energy from fat recommended in the adult diet

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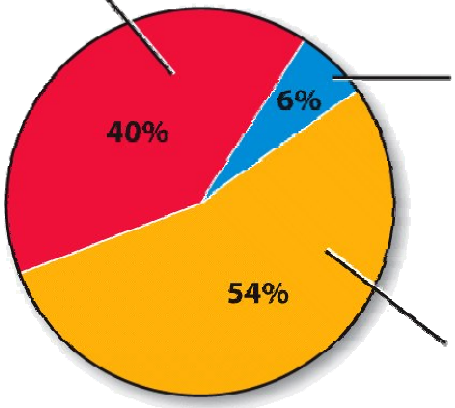
Infant nutrient needs

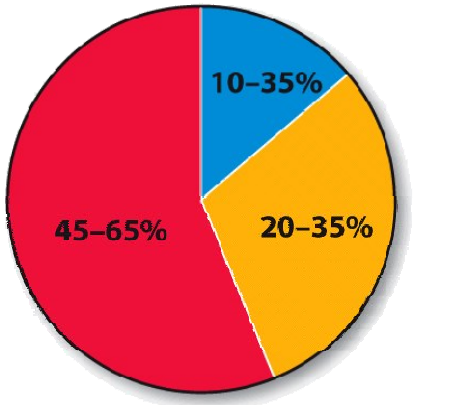
Carbohydrate is a major contributor to an infant's energy intake; most of this comes from lactose.



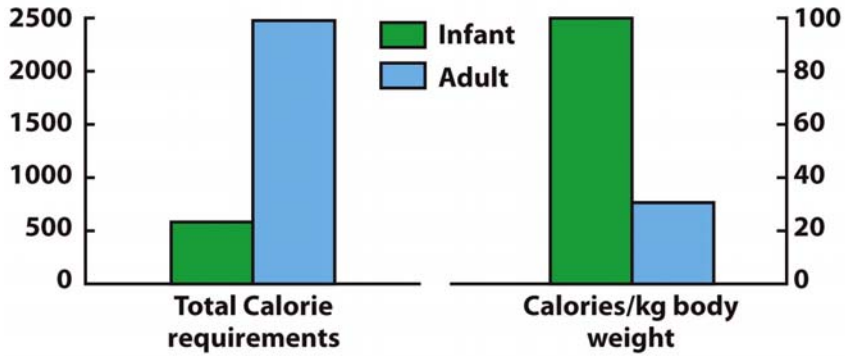
Calorie distribution in human milk

Although the proportion of calories from protein is small, representing only about 9 g/day during the first 6 months, an infant requires almost twice as much protein per kilogram of body weight (1.52 g/kg/day) than an adult (0.8 g/kg/day).

Along with enough dietary fat to meet energy needs, infants need sufficient amounts of the omega-3 fatty acid DHA and the omega-6 fatty acid ARA. These fatty acids are constituents of cell membranes and are important for development of the eyes and nervous system.



Recommended calorie distribution for the adult diet



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Infant nutrient needs

- Water: need to consume more water per unit of body weight than do adults
  - Healthy infants who are exclusively breast fed do not require additional water
- Iron // AI from 0–6 months = 0.27 mg/day
  - RDA for 7–12 months = 11 mg/day; formula-fed infants should be fed iron-fortified formula

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Infant nutrient needs

- Vitamin D
  - Breast-fed infants should be supplemented with 400 IU (10 µg) /day until consuming about 1 L (4 cups) of vitamin D-fortified formula/milk daily
  - Formula-fed infants consuming less than 1 L/day should receive supplement of 400 IU (10 µg)/day
- Vitamin K:
  - All newborns should receive a 0.5-1.0 mg injection

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Breast feeding

- Breast feeding recommended for newborns of healthy, well-nourished mothers
- US health professionals recommend exclusive breast feeding for 6 months and breast feeding with complementary foods for at least 1 year and as long thereafter as mutually desired
- Lactation can continue as long as suckling is maintained

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Formula feeding

Joel Sartore/NG Image Collection

K.L. Boyd, D.D.S./Custom Medical Stock Photo, Inc.

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Breast milk

- Colostrum: produced by the breast for up to a week after delivery
  - Has beneficial effects on the gastrointestinal tract
  - Nutrients it supplies meet the infant's needs until mature milk production begins
  - Contains more water, protein, immune factors, minerals, and vitamins and less fat than mature milk
- Mature breast milk: contains an appropriate balance of nutrients in easily-digested forms

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Breast milk vs. formula

Nutritional composition of breast milk and infant formula Table 11.3

Nutrient	Amount in breast milk	Amount in formula	Comparisons
Protein	1.8 g/100 mL	1.4 g/100 mL	The relatively low protein content of human milk and formula protects the immature infant kidneys from a too-high load of nitrogen wastes. Alpha-lactalbumin, the predominant protein in human milk, forms a soft, easily digested curd in the infant's stomach. Most formula is made from cow's milk that is modified to mimic the protein concentration and amino acid composition of human milk.
Fat	4 g/100 mL	4.8 g/100 mL	The fat in human milk is easily digested. Human milk is high in cholesterol and the essential fatty acids linoleic acid and α-linolenic acid, as well as their long-chain derivatives ARA and DHA, which are essential for normal brain development, eyesight, and growth. The fat in formula is derived from vegetable oils and provides linoleic and α-linolenic acid. Some formulas are also supplemented with ARA and DHA.
Carbohydrate	7 g/100 mL	7.3 g/100 mL	Lactose, the primary carbohydrate in human milk and most formula, enhances calcium absorption. Because it is digested slowly, it stimulates the growth of beneficial acid-producing bacteria. Oligosaccharides in milk protect against respiratory and gastrointestinal disease.
Sodium	1.3 mg/100 mL	0.7 mg/100 mL	Because breast milk and formula are both low in sodium, the fluid needs of breast-fed and formula-fed infants can be met without an excessive load on the kidneys.
Calcium Phosphorus	22 mg/100 mL 14 mg/100 mL	53 mg/100 mL 38 mg/100 mL	The 2:1 ratio of calcium to phosphorus in breast milk and formula enhances calcium absorption.
Iron Zinc	0.03 mg/100 mL 3.2 mg/100 mL	0.1 mg/100 mL 5.1 mg/100 mL	Iron and zinc are present in limited amounts in breast milk but are readily absorbed. Most infant formulas are fortified with iron and zinc because the forms present are less absorbable than those in breast milk.
Vitamin D	4 IU/100 mL	41 IU/100 mL	Formulas are fortified with vitamin D, which is present at low levels in breast milk.

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Benefits of breast milk

- Formula can never exactly duplicate human milk composition
- Cells, antibodies and other substances pass to the child, providing immune protection
- Growth factors and hormones promote maturation of the infant's gut and immune defenses and enhance digestion
- Physical, emotional, and financial advantages for the mother

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Benefits of breast feeding

Cusp and Flirt/Masterfile

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When is formula better?

- Some substances can be passed to a baby in breast milk
  - Tuberculosis bacterium, HIV, nicotine, some medications, alcohol, cocaine, marijuana
- Family members can share responsibility
- Special formulas available for preterm infants and those with genetic abnormalities

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Alcohol & breast feeding

- Alcoholic mothers counseled not to breast feed
- Occasional limited alcohol is probably not harmful if alcohol intake is timed to minimize amount present in milk when infant is fed
- After consuming a single alcoholic drink, wait at least 4 hours before breastfeeding
- Alternatively, milk can be expressed before consuming the drink and fed to the infant later

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Safe infant feeding

Alamy

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Food allergies

- Common in infants due to immature digestive tracts that allow absorption of incompletely digested proteins, triggering immune response
  - Risk of developing food allergies reduced after age 3
  - Many children who develop food allergies before age 3 eventually outgrow them
  - Allergies appearing after 3 years more likely remain

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Reducing risk of food allergies

- Exclusive breast feeding for first 4–6 months
- Appropriate introduction of solid and semisolid foods
  - First: iron-fortified infant rice cereal mixed with formula or breast milk
  - Then: other grains can be introduced
  - Last // wheat cereal
- Each new food should be offered for a few days without the addition of any other new foods

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Infant feeding

- Solid and semisolid foods can be gradually introduced starting at 4–6 months
- Foods that can easily lodge in the throat should not be offered to infants or toddlers
- Cow's milk should never be fed to infants
  - At 1 year of age, whole cow's milk can be offered
  - At 2 years of age, reduced-fat or low-fat milk can be used

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Infant feeding

- Fruit juice can be fed from a cup when an infant is 9–10 months old
  - Not at bedtime or from bottles or covered cups that allow them to consume juice throughout the day
- Added sugars should be offered in moderation
- Honey should not be fed to children <1 year old

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Developmental milestones

Age	Birth to 4 months	4 to 6 months	6 to 9 months	9 to 12 months
Developmental milestones	The infant takes milk by means of a licking motion of the tongue called *suckling*, which strokes or milks the liquid from the nipple. Solid food placed in the mouth at an early age is usually pushed out as the tongue thrusts forward.	The tongue is held farther back in the mouth, allowing solid food to be accepted without being expelled. The infant can hold his or her head up and is able to sit, with or without support.	The infant can sit without support, chew, hold food, and easily move hand to mouth.	The infant can drink from a cup and feed him/herself.
Foods	Breast milk or iron-fortified infant formula.	Breast milk or formula, iron-fortified infant cereal; Rice cereal is usually the first solid food introduced because it is easily digested and less likely than other grains to cause allergies.After cereals, puréed vegetables and fruits can be introduced.	Breast milk or formula, iron-fortified infant cereal, puréed or strained vegetables, fruits, meats and beans, limited finger foods.	Breast milk or formula, iron-fortified infant cereal, chopped vegetables, soft fruits, meats and beans, fruit juice, nonchoking finger foods such as dry cereal, cooked pasta, and well-cooked vegetables.

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What is happening in this picture?

- Ultrasound is being used to get a picture of this woman's developing baby to determine the baby's size and how organs are developing

Paul Campbell/Getty Images

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Review Questions

What are similarities and differences between:

- Nutrition in teen and adult pregnancy?
- Nutrition in pregnant and non-pregnant women?
- Nutrition in breast-feeding and non-breast-feeding women?
- Colostrum and mature breast milk?
- Breast milk and formula?

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Nutrition in the news

- Plastic in infant formula
- Plastic baby bottles
- Breast feeding in public
- Laws to support breast feeding

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Checking student learning outcomes

- What advice could you give to a loved one who is thinking of getting pregnant?
- What advice could you give to a loved one who is thinking of breast feeding?
- What advice could you give to a loved one about feeding his/her infant?

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THINK about this – then share within a PAIR – then SHARE with the class

- What do you know about nutrient needs of women during pregnancy and breast feeding?
- What do you know about nutrient needs of infants?

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Concept check

- How are nutrients and oxygen transferred from mother to fetus?
- How does a mother's weight gain during pregnancy affect the health of her child?
- Why do heartburn and constipation tend to increase later in pregnancy?
- How does gestational diabetes in a mother affect the baby?

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Concept check

- What snack could a pregnant woman add to her day to meet her increased calorie and protein needs?
- Why isn't the recommendation for dietary calcium increased during pregnancy?
- Why are iron supplements recommended during pregnancy?

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Concept check

- Why does the effect of a given teratogen vary, depending on when a fetus is exposed to it?
- How does malnutrition during pregnancy affect the child's health at birth and later in life?
- Why are requirements for some nutrients different in pregnant teenage girls than in pregnant adult women?
- How much alcohol can be safely consumed during pregnancy?

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Concept check

- What does it mean if a child whose birth weight was in the 50th percentile is now in the 30th percentile for growth?
- Why do infants need more fat than adults?
- Why is breast milk the best choice for healthy mothers and babies?
- When can solid food be introduced into an infant's diet?

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What should I eat (during pregnancy)?

- Make nutrient-dense choices
- Drink plenty of fluids
- Indulge your cravings, within reason

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Concept check

- What causes milk let-down?
- Where does the energy for milk production come from?
- Why is the recommended calcium intake for a new mother not increased while she is lactating?

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Debate

Will feeding babies DHA-fortified infant formulas make them smarter and see better?

Photo Researchers, Inc.