

California Food Guide

Lifecycle: Prenatal Nutrition

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What's New?

- Decline in neural tube defects.¹
- Dietary Reference Intakes (DRIs) for pregnant women.
- Exercise guidelines during pregnancy.

Public Health Implications

Healthy People 2010 goals reflect the nation's commitment to nutrition as an essential component of improved pregnancy outcomes. The nutritional status of women prior to conception and during pregnancy is a focus area for several of the evidence-based and developmental Healthy People 2010 objectives.²

16-6: Increase the proportion of pregnant women who receive early and adequate prenatal care to 90 percent.

- In 2004, mothers of 85.7 percent of California's live births received prenatal care in their first trimester.³

16-10: Reduce the proportion of low-birth-weight infants to 5 percent and very-low-birth-weight infants to 0.9 percent.

- In 2004, 6.6 percent of California's live births were low-birth-weight (<2,500grams) and 1.1 percent were very-low-birth-weight (<1,500 grams).³

16-16: Increase the proportion of pregnancies begun with optimal folic acid levels to 80 percent.

- In 2002, 50 percent of women of childbearing age in California reported taking folic acid supplements.⁴

16-17: Increase abstinence from alcohol, cigarettes, and illicit drugs among pregnant women.

- Approximately 9 percent of women who gave birth in California during 2002 reported smoking during the first or last three months of pregnancy.⁵ Approximately 19 percent of women who gave birth in California during 2003 reported drinking during the first or last three months of pregnancy.⁶

Public Health Implications continued

19-12, 19-13: Reduce iron deficiency among females of childbearing age to 7 percent and anemia among low-income pregnant women in their third trimester to 20 percent.

Developmental objectives:

- Increase the proportion of mothers who achieve a recommended weight gain during their pregnancies.
- Decrease the proportion of pregnant women with gestational diabetes.
- Reduce the occurrence of fetal alcohol syndrome (FAS).

California Perinatal Characteristics³

Tables 1 and 2 depict outcome and demographic statewide perinatal data from 1997 to 2004. In 2004, 545,094 live births took place in California. The percent of low birthweight (LBW) (500 – 2,499 grams) live births increased from 6.0 percent in 1997 to 6.6 percent in 2004 and the percent of very low birthweight (500 – 1,499 grams) live births increased slightly from 1.0 percent in 1997 to 1.1 percent in 2004. Initiation of prenatal care in the first trimester increased from 80.8 percent in 1997 to 85.7 percent in 2004. More than half of the mothers who gave birth to live infants in 2004 were Hispanic while 46.8 percent were foreign born.

Table 1: California Perinatal Characteristics (%) 1997 – 2004³

YEAR	Live Births	First Trimester Prenatal Care	Low-Birthweight	Very Low Birthweight	Mothers Under 18 years
1997	524,668	80.8	6.0	1.0	4.6
1999	518,616	82.2	6.0	1.0	4.1
2000	531,943	83.1	6.1	1.0	3.7
2001	528,001	83.9	6.2	1.0	3.4
2002	529,559	84.8	6.3	1.0	3.3
2003	541,185	85.8	6.5	1.1	3.1
2004	545,094	85.7	6.6	1.1	3.1

Data from 1998 are missing due to unavailability of 1998 Vital Statistics.

Table 2: Maternal Race/Ethnicity Composition of 2004 Live Births in California³

White	30.2%
Hispanic	51.3%
Black	5.7%
Asian/Pacific Islander	12.4%
Other	0.5%
Foreign Born*	46.8%

*Foreign born refers to mothers who were born outside the United States.

Definition

Prenatal Nutrition

Adequate nutrition during pregnancy is extremely important to both maternal and fetal health. The nutritional requirements in pregnancy, key recommendations from the 2005 Dietary Guidelines for Americans (Dietary Guidelines), current trends in prenatal nutrition, and strategies to optimize nutrient intake will be presented in this chapter.

Dietary intake and gradual continuous weight gain in pregnancy are two of the most critical components of fetal growth and development.⁷ Nutritional requirements increase during pregnancy to support fetal growth and development as well as the increase in maternal metabolism and tissue development specific to reproduction.⁸ Nutrients supplied to the fetus come from three sources—directly from the mother’s diet, from her nutrient stores, and from nutrient synthesis within the placenta.⁹ In addition, good nutrition during pregnancy helps prepare women for breastfeeding.¹⁰

Key components of a healthy pregnancy:¹¹

- Appropriate weight gain.
- Consumption of a variety of foods in accordance with the Dietary Guidelines.
- Appropriate and timely vitamin and mineral supplementation.
- Avoidance of alcohol, tobacco, and other harmful substances.
- Safe food handling.

Preconceptional Nutrition

Although the importance of nutrition during the nine months of pregnancy cannot be overstated, maintenance of ideal weight during the childbearing years, and adequate nutrient intake prior to pregnancy contribute to a positive birth outcome. Dietary changes should be started early—preferably before conception—to maximize pregnancy outcomes and support optimal fetal growth and development. Supplementation of 400 mcg of synthetic folic acid is recommended for all women of childbearing age to reduce the risk of birth defects, should a pregnancy occur.

Adolescent Pregnancies

- In 2004, 3.1 percent of live births in California were to mothers under 18 years.³

Due to lifestyle and lack of knowledge, many pregnant adolescents fail to meet the recommended intake levels for many nutrients. Obtaining adequate energy and nutrients are paramount to ensure positive outcomes for adolescent pregnancies, especially in younger pregnant teens who are still growing themselves. Health care providers should refer pregnant teens to appropriate nutrition and assistance programs for specialized evaluation and care.

Burden

Consequences of Maternal Malnutrition

Malnutrition during pregnancy negatively affects maternal pregnancy outcome including fetal survival and growth. Malnutrition is caused by eating either too little, too much, or a diet that lacks essential nutrients.¹² Anemia is the most common nutrient-related problem of pregnancy, and is attributable to iron deficiency nearly 90 percent of the time, with the remainder due to folate deficiency.¹³

A malnourished mother is more likely to give birth to a LBW baby susceptible to disease and premature death.¹⁴ Low-income women face substantial barriers to achieving the recommended nutrient intake and weight gain and poverty is a major risk factor for poor pregnancy outcomes.¹¹

Adolescent girls and their infants are particularly vulnerable to the effects of malnutrition. Infants born to teens are more likely to be low birthweight and have a higher risk of dying in the first year of life.¹⁵

In a recent California population-based study, LBW and very low birthweight (VLBW) infants had significantly longer hospital stays, which accounted for a significantly higher proportion of total hospital costs than infants of normal birthweight. The findings revealed that LBW infants accounted for 5.9 percent of the cases and 56.6 percent of total infant hospital costs, whereas VLBW infants accounted for 0.9 percent of the cases and 35.7 percent of total infant hospital costs.¹⁶

Obesity occurs when excessive calories are consumed relative to energy expenditure. Maternal obesity is a risk factor for maternal and fetal malnutrition. In addition, it increases the risk of gestational diabetes, cesarean deliveries, complications during delivery, macrosomia, congenital defects, and childhood obesity.¹⁷ Uncontrolled diabetes and abnormal birthweight may also contribute to overweight, obesity, and/or diabetes later in life.

Factors Leading to Obesity

A. Diet and Physical Activity

Poor diet and physical inactivity are the most influential factors contributing to the increase in overweight and obesity in the United States.¹⁸ Pregnant women and women

of childbearing age are not immune to these factors. Diet counseling during pregnancy should ensure that energy and nutrient intake is neither excessive nor deficient.¹³ Maternal weight gain alone does not mean a woman is consuming foods that meet the nutritional requirements of pregnancy. It is important to balance the risk of maternal overweight due to excessive pregnancy weight with the risk of poor fetal growth associated with low weight gain.¹¹ Compliance with the 1990 Institute of Medicine (IOM) recommendations for weight gain based on body mass index (BMI)* leads to optimal maternal and neonatal outcomes and no increased risk for postpartum weight retention.¹⁹

*BMI equals a person's weight in kilograms divided by height in meters squared (BMI=kg/m²).

Eating food away-from-home

Household income spent on away-from-home foods rose from 25 percent of total food spending in 1970 to nearly one half in 1999.²⁰ A small study of 150 women in Texas suggests that eating food away from home during pregnancy contributes to a higher intake of energy, total fat, and saturated fat.²¹

B. Food Security

Access to enough food at all times defines food security while food insecurity refers to a household with limited or uncertain availability of food. Achieving adequate nutrition is dependent on a number of socioeconomic factors including, age, family income, social status, ethnicity, education, employment, marital status, and availability of healthcare and support systems.¹⁵ Ensuring a nutritious food supply for pregnant women is a primary focus of prenatal care in California.

In a recent study among pregnant women, income level was the characteristic most predictive of food security. The study also found that life stress and coping behaviors may be as important as income in determining an individual's risk for food insecurity.²² Many food-insecure households reduce the quality, variety, and desirability of their diets because they are worried or unsure whether they will be able to get enough to eat.²³

California's Women Infants and Children (WIC) Supplemental Nutrition program is available to low-income pregnant, breastfeeding, and postpartum women and children under age five who are at nutritional risk and who are at or below 185 percent of the federal poverty level. The goal of the WIC program is to decrease the risk of poor birth outcomes; and to improve the health of participants during critical times of growth and development. Nutrition education, breastfeeding promotion, medical care referrals, and specific supplemental nutritious foods which are high in protein and/or iron are provided. Many WIC participants are eligible for Food Stamps and vice versa. Food Stamp offices in California are operated by local county welfare departments. Low-income people may apply for food stamps at any office located in the county where they live. Food Stamps can be used to purchase foods for human consumption and seeds and plants to grow food for household use.

Consequences of food insecurity for women of child-bearing age in low-income households:²²

- Reduced micronutrient intake.²⁴

- Overweight.²⁵
- Inability to return to pregravid weight postpartum.²⁶

C. Media

In the United States, pregnant women are bombarded with warnings, health messages, and advisories about what to eat and drink during pregnancy. Conflicting messages from the media, government, industry, health care professionals, family, and friends can be overwhelming. According to a 2003 Food Marketing Institute survey the top seven sources for consumers seeking information about health and nutrition include: healthcare professionals, books, magazines, family/friends, newspapers, television, and the Internet.²⁷ In the 2000 California Women's Health Survey, magazines and television combined were the main source of information about folic acid.⁴ When planning prenatal nutrition programs, sources of information must be considered.

Dietary Recommendations

Dietary Recommendations During Pregnancy

The Dietary Guidelines recommend that nutrient needs should be met primarily through consuming food.¹⁸ In pregnancy, supplementation with fortified foods and eating a nutrient-dense food-based diet is indicated for most women.¹³ The new MyPyramid Food Guidance System²⁸ Intake Pattern is not specifically applicable for pregnancy or lactation. However, the recommendations in the MyPyramid Education Framework: variety, proportionality, moderation, and activity—are concepts that health professionals can expand upon when counseling about nutrition. Throughout pregnancy, when nutrient needs are very important for mother and baby, women should be addressing nutrition and diet with a health care provider or registered dietitian. Later in this chapter a recommended food guide for pregnant women is provided.

The Dietary Guidelines¹⁸ identifies pregnant women as a special population group. The key recommendations for women of childbearing age that may become pregnant are listed in Table 3.

Table 3: Dietary Guidelines for Pregnant Women and Women of Childbearing Age Adapted for California¹⁸

Adequate Nutrients Within Calorie Needs
Women of childbearing age who may become pregnant and those in the first trimester of pregnancy should consume adequate synthetic folic acid daily (from fortified foods or supplements) in addition to food forms of folate from a varied diet.
Women of childbearing age who may become pregnant should eat foods high in heme-iron and/or consume iron-rich plant foods or iron-fortified foods with an enhancer of iron absorption, such as vitamin C-rich foods.
Weight Management
Pregnant women should ensure appropriate weight gain as specified by a healthcare provider.
Physical Activity
In the absence of medical or obstetric complications, incorporate 30 minutes or more of moderate-intensity physical activity on most, if not all, days of the week. Avoid activities with a high risk of falling or abdominal trauma.
Alcoholic Beverages
Alcoholic beverages should not be consumed by some individuals, including those who cannot restrict their alcohol intake, women of childbearing age who may become pregnant, pregnant and lactating women, children and adolescents, individuals taking medications that can interact with alcohol, and those with specific medical conditions.
Food Safety
Pregnant women should not eat or drink raw (unpasteurized) milk or any products made from unpasteurized milk: raw or partially cooked eggs or foods containing raw eggs, raw or undercooked meat and poultry, raw or undercooked fish or shellfish, unpasteurized juices, and raw sprouts.
Pregnant women should only eat certain deli meats and frankfurters that have been reheated to steaming hot.

Reducing the Risk of Mercury Toxicity

In 2004, EPA and FDA issued three safety tips to reduce the risk of fetal exposure to methylmercury.²⁹

1. Do not eat shark, swordfish, king mackerel, or tile fish because they contain high levels of methylmercury.
2. Eat up to 12 ounces (two average meals) a week of a variety of fish and shellfish that are lower in mercury.*
 - a. Five of the most commonly eaten fish that are low in mercury are shrimp, canned light tuna, salmon, pollack, and catfish.
 - b. Another commonly eaten fish, albacore (white) tuna has more mercury than canned light tuna. So, individuals may eat up to 6 ounces (one average meal) of albacore tuna per week.
3. Check local advisories about the safety of fish caught by family and friends in local lakes, rivers, and coastal areas.

* One meal is about six ounces of cooked fish or 1/2 pound (eight ounces) of uncooked fish.

If no advice is available, six ounces of fish caught from local waters may be eaten per week, however; no other fish should be consumed during the same week. These guidelines also apply to women who might become pregnant, nursing mothers, and young children.

By following these guidelines, pregnant women can obtain the health benefits that fish and shellfish provide while reducing the risk of neurological damage to the developing fetus. One such health benefit is the addition of omega-3 fatty acids to the diet. Preliminary evidence suggests there is a correlation between maternal omega-3 fatty acid consumption and neonatal functional outcomes.

Reducing the Risk of Listeriosis

Listeriosis, an infection caused by the bacterium *Listeria monocytogenes*, is particularly dangerous to pregnant women. This bacterium can be found in refrigerated, ready-to-eat foods, (meat, poultry, seafood, unpasteurized milk, and milk products or foods made with unpasteurized milk) and soil. Unlike most food bacteria that have a slow rate of growth in the refrigerator, *Listeria monocytogenes* can grow rapidly at refrigerator temperatures.³⁰ Risks of listeriosis include preterm delivery, spontaneous abortions, stillbirth, and neonatal death.³⁰

Dietary Reference Intakes for Pregnant Women

The Dietary Guidelines and the DRIs apply to average daily diets consumed over several days, not a single day or single meal.³¹ DRIs is a generic term for a set of nutrient reference values that include the Recommended Dietary Allowance (RDA)* and Adequate Intake (AI).**

The current DRIs distinguish specific vitamin, mineral, and macronutrient needs for pregnant females between the ages of 14-18 years, 19-30 years, and 31-50 years.³²⁻³⁶

Calorie needs increase by about 300 kcal per day starting with the second trimester of pregnancy. This is approximately a 15 to 20 percent increase in the energy needs compared to non-pregnant woman. An increase in the basal metabolic rate (BMR)^{***} is one of the major components of increased energy requirements during pregnancy.³⁷ Adolescent, active, or nutritionally deficient women may require more calories. However, the percentage increase in calories is small relative to the estimated need for most other nutrients.⁸ Table 4 lists the RDAs and AIs for pregnant and non-pregnant women in three life stage group.

***Recommended Dietary Allowance (RDA)** is the average daily dietary intake level that is sufficient to meet the nutrient requirement of nearly all (97 to 98 percent) healthy individuals in a particular life stage and gender group.³¹

****Adequate Intake (AI)** is the recommended daily intake value based on observed or experimentally determined approximations of nutrient intake by a group (or groups) of healthy people that are assumed to be adequate—used when an RDA cannot be determined.³¹ There is much less certainty about the AI value than about the RDA value. Because AIs depend on a greater degree of judgment than is applied in estimating the EAR and subsequently an RDA, the AI might deviate significantly from and be numerically higher than the RDA if it could be determined. For this reason, AIs must be used with greater care than is the case for RDAs.³¹

*****Basal Metabolic Rate (BMR)** is the energy required to sustain basal metabolism and keep the body alive. Basal metabolic energy includes the energy needed to maintain nervous activity, ventilate the lungs, keep the heart pumping to circulate blood, maintain minimal levels of protein synthesis as well as many other biochemical reactions and functions.

Table 4: Recommended Dietary Allowances and Adequate Intakes for Pregnant and Non-Pregnant Women in Three Life Stage Groups³²⁻³⁶

		Pregnant Women			Non-Pregnant Women		
Age (years)		14 - 18	19 - 30	31 - 50	14- 18	19 - 30	31- 50
Carbohydrate	g/d	175	175	175	130	130	130
Total Fiber*	g/d	28	28	28	26	25	25
Protein	g/d	71	71	71	46	46	46
Folate	ug/d	600	600	600	400	400	400
Iron	mg/d	27	27	27	15	18	18
Calcium*	mg/d	1,300	1,000	1,000	1,300	1,000	1,000
Thiamin	mg/d	1.4	1.4	1.4	1.0	1.1	1.1
Riboflavin	mg/d	1.4	1.4	1.4	1.0	1.1	1.1
Niacin	mg/d	18	18	18	14	14	14
Vitamin A	ug/d	750	770	770	700	700	700
Vitamin B12	ug/d	2.6	2.6	2.6	2.4	2.4	2.4
Vitamin B6	mg/d	1.9	1.9	1.9	1.2	1.3	1.3
Vitamin C	mg/d	80	85	85	65	75	75
Vitamin D*	ug/d	5	5	5	5	5	5
Vitamin E	mg/d	15	15	15	15	15	15
Vitamin K*	ug/d	75	90	90	75	90	90
Phosphorus	mg/d	1,250	700	700	1,250	700	700
Iodine	ug/d	220	220	220	150	150	150
Magnesium*	mg/d	400	350	360	360	310	320
Zinc	mg/d	13	11	11	9	8	8
Selenium	ug/d	60	60	60	55	55	55
Fluoride*	mg/d	3	3	3	3	3	3
Potassium*	g/d	4.7	4.7	4.7	4.7	4.7	4.7
Sodium*	g/d	1.5	1.5	1.5	1.5	1.5	1.5

Recommended Dietary Allowances are in bold type and Adequate Intakes are in ordinary type followed by a (*).

Daily Food Choices for Pregnant Women

When pregnant women make healthful food choices based on the information provided in Table 5 they are more likely to meet recommended intakes of nutrients. In addition, they are also more likely to have macronutrient intakes that fall within acceptable nutrient distribution ranges of the Dietary Reference Intakes.

Daily Food Choices for Pregnant Women is only a guide and may not be suitable for all pregnant women.

Table 5: Daily Food Choices for Pregnant Women^ψ

Food Groups	Recommended Amounts of Food for Pregnant Women	Standard Amounts of Food
Breads, Grains, Cereals	7 to 9 of these choices or (7-9) 1 ounce equivalents (Make half of these choices of whole grain)	1 ounce equivalent is: 1 slice whole grain bread 1 cup dry cereal ½ cup cooked cereal, rice, noodles 1 roll, pancake, small tortilla ½ bagel, English muffin, pita 4 crackers
Vegetables	3 cups of these choices or (6) ½ ounce equivalents	½ ounce equivalent is: ½ cup of cut-up raw or cooked vegetables like: carrots, broccoli, sweet potatoes, spinach, pumpkin, squash, peppers, tomatoes, greens, cabbage, snow peas 1 cup leafy raw vegetables like: romaine and green leaf lettuce ½ cup of 100% vegetable juice
Fruits	2 cups of these choices or (4) ½ cup equivalents	½ cup-equivalent is: 1 medium fruit ½ cup 100% fruit juice with vitamin C ½ cup cut-up fresh, frozen, canned fruit like: oranges, strawberries, melon, kiwi, melon, papaya, apricots, grapefruit ¼ cup dried fruit
Milk Products	3 to 4* of these choices * 4 cups for teens	1 cup-equivalent is: 1 cup low-fat or fat-free milk or yogurt 1 ½ ounces cheese 2 ounces low-fat cheese 1 cup pudding or custard made with milk 1 ½ cups frozen yogurt or ice cream 1 cup calcium-fortified lactose free milk or soy milk
Protein Foods	6 of these choices or (6) 1 oz equivalents	1 ounce-equivalent is: Animal Protein: 1 ounce of cooked meat, poultry, or fish 1 egg ½ cup cottage cheese Vegetable Protein: ¼ cup cooked, dry beans, peas, lentils ¼ cup tofu 1 Tablespoon peanut butter ½ ounce nuts or seeds
Oils	6 teaspoons	1 teaspoon equivalent is: 1 Tablespoon low-fat mayonnaise 2 Tablespoons light salad dressing 1 teaspoon vegetable oil

^ψ This table for was adapted from the 2005 Dietary Guidelines for Americans. Daily Food Choices for Pregnant Women is only a guide and may not be suitable for all pregnant women.

Protein

Protein needs increase by 25 grams per day during pregnancy. This increase—equivalent to about three ounces of meat—supports the synthesis of maternal and fetal tissue. Meat, eggs, chicken, turkey, and fish are good sources of animal protein while beans, lentils, tofu, peanut butter, and other nuts are good sources of vegetable protein. Foods high in protein also provide other important nutrients such as vitamin B₆, iron, and zinc. Animal foods provide vitamin B₁₂, while vegetable foods supply fiber.

Reasons for increased protein during pregnancy:³⁸

- Rapid growth of the fetus.
- Development of the placenta.
- Growth of maternal tissues.
- Increased maternal blood volume.
- Amniotic fluid.
- Functional reserve.

Folate

Folate is a B vitamin required for DNA synthesis and cell division, red blood cell formation, and some metabolic reactions. Folate requirements increase during pregnancy to support cell division in maternal and fetal tissue. Folic acid is the synthetic form of folate found in supplements and fortified foods. If a woman has enough folic acid in her body before and during pregnancy, her baby is less likely to develop a neural tube defect (NTD). Folic acid can reduce the risk of NTDs by up to 70 percent.³⁹ An NTD occurs when the neural tube fails to close properly. Spina bifida and anencephaly are the two most common types of NTDs and occur when the lower and upper end of the neural tube fail to close, respectively. A daily intake of 400 micrograms per day of synthetic folic acid (fortified foods or supplements) in addition to food forms of folate from a varied diet is recommended for women of childbearing age who may become pregnant.¹⁸ It is known that natural folate does not raise blood folate levels as much as equal amounts of synthetic folic acid. In addition, current research does not indicate whether naturally occurring folate from food shows a protective effect against NTDs.¹⁸ The RDA increases to 600 micrograms per day of folate during pregnancy to support fetal growth and rapid cell division. Table 6 lists sources of folate.

The U.S. Food and Drug Administration authorized the addition of folic acid to enriched breads, cereals, flours, corn meals, pastas, rice, and other grain products in March 1996, with compliance mandatory by January 1998.⁴⁰ A 19 percent reduction in NTD birth prevalence occurred following folic acid fortification of the US food supply.³⁹

In 2005, 33.0 percent of women ages 18-45 reported taking a multi-vitamin containing folic acid in the United States.⁴¹

Table 6: Sources of Folate/Folic Acid³⁹

Sources of Folate/Folic Acid	
Synthetic folic acid supplements	Prenatal vitamins, multivitamins or folic acid supplements
Folic acid fortified enriched foods	Enriched cereals, bread, flour, cornmeal, pasta, rice and others.*
Foods naturally folate rich	Legumes i.e. black beans, navy beans, pinto beans, black-eyed peas, lentils Dark green leafy vegetables, i.e. spinach, collards, turnip greens, broccoli, asparagus, okra Citrus fruits and juice, i.e. orange. Nuts and nut butter, i.e. peanuts, almonds, pecans, mixed nuts meat, eggs
*Choose fortified enriched foods with 400 mcg of folic acid per serving.	

Iron

An increase in the maternal blood supply during pregnancy greatly increases the demand for iron.⁴² The RDA for iron for pregnant women is 27mg/d.³⁵ This is significantly higher than a non-pregnant woman's normal need of 18mg/d. Consuming foods high in Vitamin C along with plant (non-heme) sources of dietary iron enhances the body's ability to absorb iron. Iron deficiency anemia in pregnancy increases the risk of preterm birth and low-birth-weight and is also related to lower scores on intelligence, language, gross motor control, and attention tests in children at the age of five years.⁴³
⁴⁴ Generally speaking, anemia is the lack of adequate blood cell size or hemoglobin, causing inadequate transport of oxygen to all the cells in the body.

See the California Food Guide Chapter on Iron Deficiency for more information.

Calcium

Calcium absorption in women increases two-fold during pregnancy.⁹ Consequently, the calcium requirements of pregnant women are similar to those of non-pregnant women. However, requirements for teenagers, increase by 300 mg for accumulation of optimal bone mineral. An extra 8 ounce glass of milk would provide the added calcium needed by a 14-18 year-old women. In addition, women with pregnancy-induced hypertension may also benefit from higher calcium intakes.¹³ Good sources of calcium include, milk, cheese, and yogurt. Women diagnosed with lactose intolerance may benefit from dairy products with less lactose, such as cheese, yogurt, or milk with added lactase enzyme. Additional non-dairy based sources of calcium include fortified ready-to-eat cereals; fortified soy-based beverages with added calcium; calcium fortified juices, green leafy vegetables like kale; tofu processed with calcium; corn tortillas processed with lye; and canned salmon with bones or other small fish eaten with whole bones (i.e., sardines). Calcium supplementation may be necessary for some women.

Planning diets for pregnant women:³¹

- 1) Plan a diet that the pregnant woman will consume—one that is palatable, economical, culturally appropriate and safe.
- 2) Set nutrient goals that are appropriate. Consider pre-pregnancy weight, prenatal weight gain, nutrition status, social and psychological status.

Prenatal Vitamins

For women who do not ordinarily consume a balanced diet and for those at nutrition risk, a daily multiple-vitamin-mineral supplement beginning in the second trimester may be recommended by some physicians. The supplement should include the nutrients listed in Table 7. Supplementation of other nutrients may be needed for some pregnant women.

Table 7: Recommended Contents of a Prenatal Supplement⁴⁵

Iron	30 mg	Vitamin B ₆	2 mg
Zinc	15 mg	Folate*	300 mcg
Copper	2 mg	Vitamin C	50 mg
Calcium	250 mg	Vitamin D	5 mcg

*Most prenatal supplements have 400 mcg of folic acid, an amount that will assist pregnant women in reaching the DRI recommendation of 600 mcg folate.

Weight Gain During Pregnancy

- **Women should begin their pregnancy at a healthy weight.**
- **Goals for weight gain should be based on pre-pregnancy BMI, which is determined by an individual's weight and height.**

The 1990 Institute of Medicine (IOM) guidelines for weight gain during pregnancy recommend weight gain based on pre-pregnancy body mass index (BMI).⁴⁵ The guidelines have been validated by numerous studies indicating that weight gain in accordance with these guidelines is associated with optimal birth weight and obstetrical outcomes.^{19, 46} However, most pregnant women do not gain weight in accordance with the guidelines.¹⁹ In fact, according to the 2003 National Pregnancy Nutrition Surveillance Study (PNSS), 44.2 percent of women gained more and 25.2 percent gained less than the IOM recommendations.⁴⁷ Weight status at the beginning of pregnancy is also of concern. The 2003 PNSS revealed that 43.0 percent of women were overweight and 12.1 percent were underweight at the beginning of their pregnancy.⁴⁷ Excess weight gain during pregnancy and failure to lose weight after pregnancy have been shown to be predictors of long-term weight changes and higher BMI many years after pregnancy.⁴⁸ It is important to remember that weight gain alone should not be considered a perfect diagnostic or screening tool for good perinatal outcomes.¹⁹ Table 8 lists the 1990 IOM recommendations for total weight gain during

pregnancy. Table 9 lists the approximate weekly weight gain guidelines for the second and third trimesters of pregnancy. In 2006, IOM organized a committee of experts to prepare a summary report about recent trends in maternal weight gain (prior to, during, and after pregnancy) and the impact of maternal weight during pregnancy on the health of mothers and their children (up to 12 months). Once this report is released, the 1990 recommendations for weight gain during pregnancy may be revised.

Table 8: 1990 Institute of Medicine Recommendations for Weight Gain During Pregnancy^{45, *}

Body Mass Index (BMI)	Wt. Gain (kgs)	Wt. Gain (lbs)	Wt. Gain per 2 weeks
<19.8	12.5 - 18.5 kgs	28 - 40 lbs.	0.5 kg
19.8 - 26	11.5 - 16 kg	25 - 35 lbs.	0.4 kg
>26 - 29	7 - 11.5 kg	15 - 25 lbs.	0.3 kg
BMI > 29	At least 7.0 kg	At least 15 lbs.	
Twin Pregnancy	15.9 - 20.4 kg	34 - 45 lbs.	0.7 kg
Triplet Pregnancy		(50 lbs.)	

BMI = wt/ht² = body weight in kilograms/height in meters²

1 kilogram = 2.2 pounds

*Adolescents less than two years post-menarche should be advised to stay within the IOM-recommended BMI-specific weight range—without either restricting weight gain or encouraging weight gain at the upper end of the range.

Table 9: Institute of Medicine Approximate Weekly Weight Gain Guidelines for the Second and Third Trimesters^{45, **}

Low Body Mass Index (BMI) (BMI <19.8)	Slightly more than 1lb/week
Normal BMI (19 - 26)	1 lb/week
High BMI (BMI 26-29)	2/3 lb/week

**In addition, the data support a weight gain of 1.5 pounds per week for normal-weight women during the second half of a twin pregnancy. Suitor CW. 1997. *Maternal Weight Gain: A Report of an Expert Work Group*. Arlington, VA: National Center for Education in Maternal and Child Health.

Exercise During Pregnancy

The American College of Obstetricians and Gynecologists (ACOG) and the 2005 Dietary Guidelines for Americans recommend **30 minutes or more of moderate-intensity physical activity per day for most days of the week during pregnancy** in the absence of medical or obstetric complications.^{18, 49} The ACOG guidelines also promote exercise for previously sedentary pregnant women and for those with medical or obstetric complications, but only after they have undergone medical evaluation and clearance. The health benefits from exercise during pregnancy include: reducing the risk of gestational diabetes, excessive weight gain, pregnancy induced hypertension, thrombosis, and lower back pain.⁵⁰ Other possible benefits include reduced stress,

enhanced ability to cope with postpartum depression, shorter labors, and enhanced feelings of physical and emotional wellbeing.⁴⁹

Perhaps the greatest benefit for women who exercise during pregnancy is the increased likelihood of continued exercise beyond the nine months of pregnancy. Establishing a pattern of regular exercise will provide health benefits well beyond the reproductive years.⁵⁰

Examples of moderate-intensity physical activity:¹⁸

- brisk walking
- swimming
- dancing
- hiking
- resistance training
- light gardening/yard work
- stretching
- stationary cycling

Pregnant women should avoid activities that increase the risk of falls, result in excessive joint stress or have a high risk for trauma such as downhill skiing, gymnastics, ice hockey, horseback riding, kickboxing, soccer and vigorous racquet sports.

Pregnant women should stop exercising and call their doctor if they get any of these symptoms:⁴⁹

- vaginal bleeding
- shortness of breath before exercising
- dizziness
- headache
- chest pain
- muscle weakness
- calf pain or swelling
- preterm contractions
- decreased fetal movement
- amniotic fluid leakage

Special Dietary Considerations During Pregnancy

Vegetarian Diets

“Well-planned total vegetarian (vegan), lacto-vegetarian, and lacto-ovo-vegetarian diets are appropriate for all stages of the life cycle, including pregnancy and lactation.”⁵¹ Special attention should be given to the intake of protein, vitamin B₁₂, vitamin D, iron, calcium, and folic acid to insure nutrient needs are being met. The Dietary Guidelines recommend nuts and legumes as alternative food choices (for meat, poultry, and/or fish) for vegetarians in the general population. These substitutions are also appropriate for pregnant women.

Multiple Gestation, Including Twins

Multiple births accounted for 3.3 percent of all births in the United States in 2003.⁵² The results are similar in California, with multiple births accounting for 2.9 percent and 3.0 percent of live births in 2003 and 2004, respectively.³ Infants of multiple births have a much greater risk of premature birth and low-birthweight. Adequate prenatal nutrition and appropriate weight gain improves the chance that infants of multiple gestation will be born close to term and achieve a healthier birth outcome.⁵³ (See Table 8)

Common Concerns/Strategies

Gestational Diabetes

Pregnant women who have never had diabetes before but who have high blood glucose levels during pregnancy have gestational diabetes (GDM). GDM complicates approximately 7 percent of all U.S. pregnancies annually, resulting in about 200,000 cases per year.⁵⁴ Of these women, 20 – 50 percent have a chance of developing type 2 diabetes in the five to ten years following their pregnancy.⁵⁴ Treatment of GDM may include special meal plans, physical activity, oral hypoglycemic therapy, insulin therapy, and blood glucose monitoring. The most common prenatal risk of gestational diabetes is fetal macrosomia.

Women with GDM should receive nutritional counseling that is consistent with the recommendations by the American Diabetes Association. In California, many physicians, nurses, registered dietitians, social workers, and other health care professionals follow the Guidelines for Care for GDM through the California Diabetes and Pregnancy Program. This program is also known as Sweet Success. The goal of Sweet Success is to improve pregnancy outcomes, such as reducing fetal deaths and neonatal complications.

Gestational Diabetes is more common in women who:⁵⁵

- Have a first degree relative with diabetes.
- Are obese.
- Are from one of the following ethnic groups: American Indian, African American, Hispanic, Asian/Pacific Islander.
- Have had a previous baby weighing more than nine pounds.
- Had a previous baby that died before birth (stillbirth).
- Have polycystic ovarian syndrome.
- Have chronic use of medications that increase the risk of diabetes (e.g. steroids).

Smoking

Approximately 9 percent of women who gave birth in California during 2002 reported smoking during the first or last three months of pregnancy. Smoking during pregnancy is linked with poor pregnancy outcomes including low-birth-weight (small for gestational age or preterm delivery), sudden infant death syndrome (SIDS), and stillbirths. In addition to contributing to infant illness and death, these problems are associated with

serious child and adult health problems such as asthma.⁵ Health risks can be reduced if a woman quits smoking by the fourth month of pregnancy.¹⁰

The California Smokers' Helpline is a telephone program funded by the California Department of Health Services. This free service provides referrals and one-on-one counseling over the phone. Pregnant women who smoke may call 1-800-No-Butts for more information.

Alcohol

Approximately 19 percent of all pregnant women in California reported drinking alcohol during the first or third trimester of pregnancy in 2003.⁶ The Dietary Guidelines state that even moderate drinking during pregnancy may have behavioral or developmental consequences for the baby. The adverse effects of alcohol on the developing fetus represent a spectrum of structural anomalies and behavioral and neurocognitive disabilities, commonly referred to as fetal alcohol syndrome (FAS). FAS is characterized by abnormal facial features, growth retardation, and central nervous system disorders. FAS is one of the leading preventable birth defects associated with mental and behavioral impairment. Many children have some, but not all, of the clinical signs of FAS. This is referred to as Fetal Alcohol Spectrum Disorder (FASD) and may include: fetal alcohol effects (FAE), alcohol-related neurodevelopmental disorder (ARND), and alcohol-related birth defects (ARBD).

Illicit Drug Use

Drug use by pregnant women can increase the risk of a small for gestational age infant.⁵⁶ According to the 2003-2004 National Survey on Drug Use and Health report, an estimated 4.6 percent of pregnant women aged 15 to 44 years reported using illicit drugs in the past month.⁵⁷ Marijuana was the most common illegal drug used by pregnant women. The March of Dimes encourages pregnant women who use illicit drugs (with the exception of heroin) to stop using drugs immediately. Women who use heroin should consult their health care provider or a drug treatment center about methadone treatment.⁵⁸

Caffeine

Available evidence suggests that a caffeine intake of up to 300 mg per day is not harmful to the fetus.¹³ Eight ounces of brewed coffee contains about 125 mg of caffeine. Other sources of caffeine include: black tea, regular and diet soda and unsweetened cocoa and chocolate. Some of the health concerns associated with excessive caffeine consumption during pregnancy include delayed conception, shorter gestation and lower birth weight.^{59, 60}

Morning sickness/hyperemesis gravidarum

Nausea and vomiting or morning sickness is a common problem during pregnancy—particularly during the first trimester. It rarely continues throughout the entire pregnancy. Hyperemesis gravidarum is a serious medical condition of pregnancy that

involves repeated episodes of vomiting. It can cause rapid weight loss, dehydration and other dangerous changes in the levels of blood components.¹⁰

General guidelines for the treatment and prevention of morning sickness:

- Eat six to eight small meals per day.
- Avoid being without food for long periods of time.
- Drink fluids between meals (so as not to overfill the stomach).
- Avoid foods that are greasy, fried, or highly spiced.
- Avoid foul or unpleasant odors.
- Rest when tired.

Heartburn

Pregnant women may experience heartburn (burning pain in the lower esophagus) caused by the reflux of food and acid from the stomach.¹⁵ Heartburn tends to worsen throughout pregnancy as the growing uterus exerts pressure on the abdominal cavity.

Dietary recommendations for the prevention and treatment of heartburn:¹⁰

- Eat six to eight small meals per day
- Drink less while eating, drink fluids between meals
- Avoid foods that tend to make heartburn worse (varies for individuals)
- Avoid lying down with a full stomach
- Wear loose clothing
- Elevate shoulders and head when lying down to prevent the flow of stomach contents into the esophagus.

Medical intervention may be necessary if the woman is spitting up blood, has difficulty swallowing, has black stools or weight loss or heartburn persists for extended periods of time.

Constipation

Constipation is a common concern during pregnancy. Constipation may result from increased relaxation of the intestines, increased water retention by the body, and pressure placed on the intestines from the growing uterus.

Recommendations for problems with constipation:

- Eat more foods with fiber.
- Eat regular meals and snacks.
- Drink plenty of liquids.
- Try a natural laxative like prunes, prune juice, or dried apricots.

Opportunities for Improvement

- Assure pregnant women access to culturally competent medical care, medical nutrition therapy, and nutrition education.
- Support changes in communities that make it easier and safer for women of childbearing age and pregnant women to be physically active and have access to healthy foods.
- Support an environment that reduces exposure of tobacco, alcohol, and other drugs in women of childbearing age and pregnant women.

Resources/Web Sites

California Department of Health Services
Maternal Child and Adolescent Health Branch
1615 Capitol Avenue
Sacramento, California 95899-7420
1-866-241-0395
<http://www.mch.dhs.ca.gov/>

California Department of Health Services
WIC Supplemental Nutrition Branch
3901 Lennane Drive
Sacramento, California 95834
1-800-852-5770
<http://www.wicworks.ca.gov/>

California Diabetes and Pregnancy Program
Sweet Success Program-Resource Center
9170 Camino Santa Fe
San Diego, California 92121
858-536-5090
Fax: (858) 536-5099
<http://www.llu.edu/llumc/sweetsuccess/>

March of Dimes California Chapter
1050 Sansome Street, 4th Floor
San Francisco, California 94111
415-788-2202
<http://www.marchofdimes.com>

MyPyramid for Pregnancy and Breast feeding:
<http://www.mypyramid.gov/mypyramidmoms/index.html>

The National Women's Health Information Center
U.S. Department of Health and Human Services
Office of Women's Health
8270 Willow Oaks Corporate Drive,
Fairfax, Virginia 22031
1-800-994-9662
<http://www.4woman.gov>

Office of Dietary Supplements
National Institutes of Health
Bethesda, Maryland 20892 USA
<http://ods.od.nih.gov/>
ods@nih.gov

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