

September 2018

FN/Nutrition/ 2018-10pr

Alicia Kunzler, Dietetics Student; Mateja R. Savoie Roskos, PhD, MPH, RD; Carrie Durward PhD, RD

Many people in the United States, including children, do not get enough vitamin D in their diet's. In fact, about 52% of children have low levels of vitamin D in their blood(Gordon et al., 2008). While vitamin D is found in some foods, it can also be taken in supplement form, and be made in the body from sunlight absorbed by the skin. This fact sheet explains what vitamin D does, why a child might need more vitamin D, and then three ways to increase levels of vitamin D in the body: through diet, sunlight, and supplementation.



Why Does My Child Need Vitamin D?

There are many uses for vitamin D in the body. Most notably, vitamin D is an important factor for good bone health and for allowing the skeleton to grow, both of which are crucial for the healthy development of a child. (Fiscaletti, Stewart, & Munns, 2017). Vitamin D helps the body absorb and use both calcium and phosphorus to build strong bones and healthy muscles (Antonucci, Locci, Clemente, Chicconi, & Antonucci, 2018).



Individuals who are deficient in vitamin D may have unbalanced levels of calcium and can experience muscle weakness (Bischoff-Ferrari, Giovannucci, Willett, Dietrich, & Dawson-Hughes, 2006). A deficiency in vitamin D is most commonly associated with rickets, a bone softening disease in children. Vitamin D deficiency can also contribute to increased risk of bone fractures, seizures, heart failure, stunted growth, and delayed development (Fiscaletti et al., 2017). Current research is investigating links between vitamin D deficiency and higher risk of asthma, diabetes, inflammatory bowel disease, liver disease, mood disorders, and dermatitis (Antonucci et al., 2018). Recommended intakes are 400 International Units (IU) daily for healthy infants under 12 months of age and 600 IU daily for healthy children and teenagers ages 1-18 (Institute of Medicine [IOM], 2011; Wagner & Greer, 2008).

Why Might My Child be More at Risk for a Vitamin D Deficiency?

- Limited sun exposure and/or regular use of sunscreen
- Living at a northern latitude
- Children with darker skin often have decreased vitamin D production
- Low vitamin D levels in mothers during pregnancy and breastfeeding
- Infants born prematurely
- Prolonged breastfeeding without supplementation
- Dairy allergy or restriction (vitamin D is frequently added to dairy products)
- Inactive lifestyle or obesity
- Some chronic diseases (especially digestive, liver, kidney, or skin conditions)
- Some medications

What Foods Have High Amounts of Vitamin D?

The foods naturally highest in vitamin D include mushrooms, egg yolks, and oily fish (details in the table below) (Antonucci et al., 2018; United States Department of Agriculture [USDA], n.d.). Because these foods are not part of the typical Western diet, other foods such as milk, cereal, orange juice, yogurt, and margarine are frequently fortified by adding vitamin D to the product. These fortified items can be included in a healthy diet to help meet the recommendations for vitamin D (Gordon et al., 2008).



Examples of Vitamin D Content in Foods

Food	Serving Size	Vitamin D per serving (IU)
Mushrooms (with UV exposure)	1 cup	
Cremini		1110
Portabella		976
White		732
Whitefish	1 cup	696
Trout	3 oz	502
Herring	3 oz	306
Tuna	1 cup	393
Sardine	1 cup	288
Eel	3 oz	792
Whole egg (vitamin D is in the yolk)	1 egg	44
Fortified milk	1 cup	98
Fortified cereal	1 cup	100
Fortified margarine	1 Tbsp	60
Fortified yogurt	5 oz	88
Fortified orange juice	1 cup	100

(United States Department of Agriculture Agricultural Research Service., n.d.)

What About Getting Vitamin D from Sunlight?

Up to 80-90% of the body's vitamin D can come from sunlight. The body can produce its own vitamin D when skin is exposed to the ultraviolet portion of sunlight (Antonucci et al., 2018). The amount of vitamin D that can be produced in the skin is affected by exposure to ultraviolet rays, latitude, season, time of day, clothing/skin exposure, and skin pigmentation (Wagner & Greer, 2008). Sun exposure in the middle of the day is the most effective at being processed into vitamin D as compared to early mornings, evenings, and winter days in cold climates (Antonucci et al., 2018; Terushkin, et al., 2010).



The issue of sunlight gets more complicated because the ultraviolet portion of sunlight also causes sunburns and increased risk of skin cancer. In addition, sunscreen decreases the amount of ultraviolet light that is absorbed, so sunscreen can prevent the production of vitamin D in the skin (Antonucci et al., 2018). With that said, *sunscreen is essential to lowering the risk of skin cancer in children and should not be avoided in effort to increase vitamin D levels* (Antonucci et al., 2018; Wagner & Greer, 2008). As a result of these many factors, there is no easy general recommendation of how many minutes of sun exposure are needed to produce adequate vitamin D (Antonucci et al., 2018; Wagner & Greer, 2008). It is, however, recommended that infants are completely kept out of direct sunlight (Antonucci et al., 2018). For older children, to maintain a balance of increasing vitamin D production and decreasing risk of skin cancer, the recommendation is to apply sunscreen after spending approximately 10 minutes outside (Misra, Pacaud, Petryk, Collett-Solberg Kappy, 2008). While circumstances vary, 10-15 minutes of



midday sun (10 am-3 pm) in a t-shirt (face and arms exposed) in the spring, summer, and fall is enough time in the sun for a light-skinned individual to produce the right amount of vitamin D. In places north of San Francisco (all of Utah), the skin can only produce a minimal amount of vitamin D in the winter due to the reduced skin-sun exposure and less intense ultraviolet rays (Misra et al., 2008). Vitamin D deficiencies are especially common in the winter months in these areas which is why physicians often suggest getting vitamin D from other sources (generally fish or supplements) between November and March (Day, 2013).

Should My Child be Receiving Vitamin D Supplementation?

In some populations it has been found that an oral vitamin D supplement is more effective at improving health status than consuming vitamin D fortified foods or being exposed to sunlight (Al-Daghri et al., 2018). Supplementation of vitamin D may be necessary if there is not adequate vitamin D in a child's diet or if a child does not spend much time in the sun. *You should always talk to your child's health care provider before starting your child on supplementation.* A mother's level of vitamin D is also important during pregnancy and breastfeeding in determining vitamin D levels of the infant (Fiscaletti et al., 2017). The following table has recommendations for supplementation in different stages of life.



Vitamin D Supplementation Recommendations

Life Stage	Recommended Daily Amount	Recommended Method(s) of Supplementation
Pregnancy	600-4,000 IU	<ul style="list-style-type: none"> Oral supplements
Breastfeeding	2,000 IU	<ul style="list-style-type: none"> Either the baby or the mother can be supplemented while an infant is at breastfeeding age. 2,000 IU for the mother provides about 400 IU to the infant
Infants under 12 months, begin supplementation shortly after birth	400 IU	<ul style="list-style-type: none"> Liquid/drop supplements Supplementation is recommended as opposed to sun exposure for infants Breastmilk from mothers who are taking vitamin D supplements OR 32 ounces or more of vitamin D fortified formula daily
Children 1-18 years	600 IU	<ul style="list-style-type: none"> Chewable supplements 32 ounces or more of vitamin D fortified milk daily Adequate combination of sun exposure and food sources
Higher risk groups	May need 800 IU	<ul style="list-style-type: none"> See age recommendations above

(Al-Daghri et al, 2018; Antonucci et al., 2018; Fiscaletti et al., 2017; Randev, Kumar, & Guglani 2018; Terushkin et al, 2010)

Too much of any vitamin can result in a toxicity, where the body cannot get rid of enough of the vitamin and the excess can cause problems in the body. For vitamin D, a toxicity can lead to serious heart and kidney complications (IOM, 2011). Exceeding the upper limit (the highest recommended amount for most people) can be especially harmful in infants, children, and pregnant or breastfeeding women. The upper limits of vitamin D for these individuals are listed in the table below. It should also be noted that there is no risk of reaching toxicity from the vitamin D produced in the skin from sunlight (the body regulates the amount of vitamin D it produces) and the small amounts of vitamin D in foods make toxicity from food sources unlikely. To avoid toxicity, consult with a healthcare provider and keep supplementation levels below these upper limits.

Upper Limits for Vitamin D Intake/Supplementation



Age	Upper limit (IU)
0-6 months	1000
7-12 months	1500
1-3 years	2500
4-8 years	3000
9-18 years	4000
Adults (including pregnant/ breastfeeding women)	4000

How Do I Help My Child Get Enough Vitamin D?

- Read food labels to find and purchase foods fortified with or naturally rich in vitamin D. Food labels are not currently required to list vitamin D, but if they do it will be listed as a daily value percentage. Starting in 2020, the new food labels will be required to list vitamin D and will do so in micrograms. There are 0.025 micrograms in 1 IU.
- Regularly offer your child foods containing vitamin D.
- Encourage your child to play outside, encourage time outside during the early afternoon if possible.
- Talk with your child's pediatrician about vitamin D supplements, especially if your child has any of the risk factors noted above. Use the table above and recommendations from your pediatrician to decide on an appropriate amount and method for your child.
- Discuss any questions you may have about your child's vitamin D intake with your pediatrician.



For More Information and Specifics About Vitamin D:

- Healthychildren.org: <https://www.healthychildren.org/English/healthy-living/nutrition/Pages/Vitamin-D-On-the-Double.aspx>
- Vitamin D Council: <https://www.vitamindcouncil.org/about-vitamin-d/how-do-i-get-the-vitamin-d-my-body-needs/>
- Intermountain Health Care: <https://intermountainhealthcare.org/blogs/topics/heart/2013/01/getting-vitamin-d-during-the-dead-of-winter/>

References

- Al-Daghri, N. M., Abd-Alrahman, S. H., Panigrahy, A., Al-Saleh, Y., Aljohani, N., Al-Attas O. S.,...Alokail, M. (2017). Efficacy of Vitamin D interventional strategies in Saudi children and adults. *The Journal of Steroid Biochemistry and Molecular Biology*. <https://doi.org/10.1016/j.jsbmb.2017.12.004>
- Antonucci, R., Locci, C., Clemente, M. G., Chicconi, E., & Antonucci, L. (2018). Vitamin D deficiency in childhood: Old lessons and current challenges. *Journal of Pediatric Endocrinology Metabolism*, 31(3), 247-367. <https://doi.org/10.1515/jpem-2017-0391>
- Bischoff-Ferrari H.A., Giovannucci E., Willett W.C., Dietrich T., & Dawson-Hughes B (2006). Estimation of optimal serum concentrations of 25-hydroxyvitamin D for multiple health outcomes. *The American Journal of Clinical Nutrition*, 84(1), 18–28. <https://doi.org/10.1093/ajcn/84.1.18>
- Fiscaletti, M., Stewart, P., & Munns, C. F. (2017). The importance of vitamin D in maternal and child health: A global perspective. *Public Health Reviews*, 38, 19 . <https://doi.org/10.1186/s40985-017-0066-3>
- Gordon, C. M., Feldman, H. A., Sinclair, L., Williams A., L., Kleinman, P. K. Perez-Rossello, J., & Cox, J. E. (2008). Prevalence of Vitamin D deficiency among healthy infants and toddlers. *Archives of Pediatric & Adolescent Medicine*, 162(6), 505-512. <https://doi.org/10.1001/archpedi.162.6.505>
- Institute of Medicine. (2011). *Dietary Reference Intakes for Calcium and Vitamin D*. Washington, DC: National Academy Press.
- Misra, M., Pacaud, D., Petryk, A., Collett-Solberg, P. F., & Kappy, M. (2008). Vitamin D deficiency in children and its management: review of current knowledge and principles. *Pediatrics*, 122, 398. <https://doi.org/10.1542/peds.2007-1894>
- Randev, S., Kumar, P., & Guglani, V. (2018). Vitamin D supplementation in childhood—A review of guidelines. *Indian Journal of Pediatrics*, 85, 194 . <https://doi.org/10.1007/s12098-017-2476-0>
- Terushkin, V., Bender, A., Psaty, E. L., Engelsen, O., Wang S. Q., & Halpern A. C. (2010). Estimated equivalency of vitamin D production from natural sun exposure versus oral vitamin D supplementation across seasons at two US latitudes. *Journal of the American Academy of Dermatology*, 62(6), 929. <https://doi.org/10.1016/j.jaad.2009.07.028>
- United States Department of Agriculture Agricultural Research Service. (n.d.) *USDA Food Composition Databases*. Retrieved from <https://ndb.nal.usda.gov/ndb/search/list>
- Wagner, C., & Greer, F. (2008). Prevention of rickets and vitamin D deficiency in infants, children and adolescents. *Pediatrics*, 122, 1142 -1152. doi:10.1542/peds.2008-1862

SNAP and FDIPIR State or local agencies, and their subrecipients, must post the following Nondiscrimination Statement: In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, sex, religious creed, disability, age, political beliefs, or reprisal or retaliation for prior civil rights activity in any program or activity conducted or funded by USDA. Persons with disabilities who require alternative means of communication for program information (e.g. Braille, large print, audiotape, American Sign Language, etc.), should contact the Agency (State or local) where they applied for benefits. Individuals who are deaf, hard of hearing or have speech disabilities may contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English. To file a program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, (AD-3027) found online at: http://www.ascr.usda.gov/complaint_filing_cust.html, and at any USDA office, or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture Office of the Assistant Secretary for Civil Rights 1400 Independence Avenue, SW Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. This institution is an equal opportunity provider.

Utah State University is committed to providing an environment free from harassment and other forms of illegal discrimination based on race, color, religion, sex, national origin, age (40 and older), disability, and veteran's status. USU's policy also prohibits discrimination on the basis of sexual orientation in employment and academic related practices and decisions. Utah State University employees and students cannot, because of race, color, religion, sex, national origin, age, disability, or veteran's status, refuse to hire; discharge; promote; demote; terminate; discriminate in compensation; or discriminate regarding terms, privileges, or conditions of employment, against any person otherwise qualified. Employees and students also cannot discriminate in the classroom, residence halls, or in on/off campus, USU-sponsored events and activities. This publication is issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth L. White, Vice President for Extension and Agriculture, Utah State University.