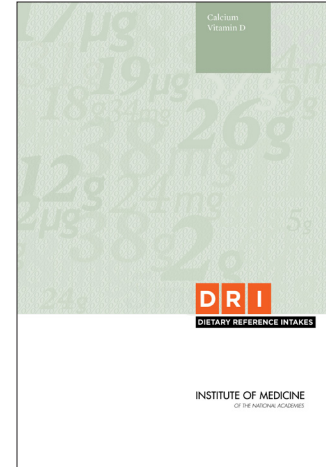


# Dietary Reference Intakes for Calcium and Vitamin D



**Calcium and vitamin D** are two essential nutrients long known for their role in bone health. Over the last ten years, the public has heard conflicting messages about other benefits of these nutrients—especially vitamin D—and also about how much calcium and vitamin D they need to be healthy.

To help clarify this issue, the U. S. and Canadian governments asked the Institute of Medicine (IOM) to assess the current data on health outcomes associated with calcium and vitamin D. The IOM tasked a committee of experts with reviewing the evidence, as well as updating the nutrient reference values, known as Dietary Reference Intakes (DRIs). These values are used widely by government agencies, for example, in setting standards for school meals or specifying the nutrition label on foods. Over time, they have come to be used by health professionals to counsel individuals about dietary intake.

The committee provided an exhaustive review of studies on potential health outcomes and found that the evidence supported a role for these nutrients in bone health but not in other health conditions. Further, there is emerging evidence that too much of these nutrients may be harmful.

**The committee provided an exhaustive review of studies on potential health outcomes and found that the evidence supported a role for these nutrients in bone health but not in other health conditions.**

## Health Effects of Vitamin D and Calcium Intake

The new reference values are based on much more information and higher-quality studies than were available when the values for these nutrients were first set in 1997. The committee assessed more than one thousand studies and reports and listened to testimony from scientists and stakeholders before making its conclusions. It reviewed a range of health outcomes, including but not limited to cancer, cardiovascular disease and hypertension, diabetes and met-

abolic syndrome, falls, immune response, neuropsychological functioning, physical performance, preeclampsia, and reproductive outcomes. This thorough review found that information about the health benefits beyond bone health—benefits often reported in the media—were from studies that provided often mixed and inconclusive results and could not be considered reliable. However, a strong body of evidence from rigorous testing substantiates the importance of vitamin D and calcium in promoting bone health.

### Dietary Reference Intakes

The DRIs are a family of nutrient reference values, including the Estimated Average Require-

ment (EAR)s and the Recommended Dietary Allowances (RDA), that are intended to serve as a guide for good nutrition and to provide the basis for the development of nutrient guidelines in both the United States and Canada. The EAR is used for planning and assessing diets of populations; it also serves as the basis for calculating the RDA, a value intended to meet the needs of nearly all people. The RDA for calcium for children ages 1 through 3 is 700 milligrams—that amount of calcium per day will meet the needs of almost all children in that age range. One thousand milligrams daily is appropriate for almost all children ages 4 through 8. Adolescents need higher levels to support bone growth: 1,300 milligrams per day meets the needs of nearly all ado-

**TABLE: Dietary Reference Intakes for Calcium and Vitamin D**

Life Stage Group	Calcium			Vitamin D		
	Estimated Average Requirement (mg/day)	Recommended Dietary Allowance (mg/day)	Upper Level Intake (mg/day)	Estimated Average Requirement (IU/day)	Recommended Dietary Allowance (IU/day)	Upper Level Intake (IU/day)
<b>Infants 0 to 6 months</b>	*	*	1,000	**	**	1,000
<b>Infants 6 to 12 months</b>	*	*	1,500	**	**	1,500
<b>1-3 years old</b>	500	700	2,500	400	600	2,500
<b>4-8 years</b>	800	1,000	2,500	400	600	3,000
<b>9-13 years old</b>	1,100	1,300	3,000	400	600	4,000
<b>14-18 years old</b>	1,100	1,300	3,000	400	600	
<b>19-30 years old</b>	800	1,000	2,500	400	600	4,000
<b>31-50 years old</b>	800	1,000	2,500	400	600	4,000
<b>51-70 year old males</b>	800	1,000	2,000	400	600	4,000
<b>51-70 year old females</b>	1,000	1,200	2,000	400	600	4,000
<b>&gt;70 years old</b>	1,000	1,200	2,000	400	800	4,000
<b>14-18 years old, pregnant/lactating</b>	1,100	1,300	3,000	400	600	4,000
<b>19-50 years old, pregnant/lactating</b>	800	1,000	2,500	400	600	4,000

\*For infants, Adequate Intake is 200 mg/day for 0 to 6 months of age and 260 mg/day for 6 to 12 months of age.

\*\*For infants, Adequate Intake is 400 IU/day for 0 to 6 months of age and 400 IU/day for 6 to 12 months of age.

**Higher levels of both nutrients have not been shown to confer greater benefits, and in fact, they have been linked to other health problems, challenging the concept that “more is better.”**

lescents. For practically all adults ages 19 through 50 and for men until age 71, 1,000 milligrams covers daily calcium needs. Women over 50 and both men and women 71 and older need no more than 1,200 milligrams per day to ensure they are meeting their daily needs for strong, healthy bones (see table for additional information).

Determining intake levels for vitamin D is somewhat more complicated. Vitamin D levels in the body may come from not only vitamin D in the diet but also from synthesis in the skin through sunlight exposure. The amount of sun exposure one receives varies greatly from person to person, and people are advised against sun exposure to reduce the risk of skin cancer. Therefore, the committee assumed minimal sun exposure when establishing the DRIs for vitamin D, and it determined that 600 International Units (IUs) of vitamin D per day meets the needs of almost everyone in the United States and Canada (see table). People age 71 and older may need as much as 800 IUs per day because of potential changes in people's bodies as they age.

### **Questions About Current Intake**

National surveys in both the United States and Canada indicate that calcium may remain a nutrient of concern, especially for girls ages 9-18. Some postmenopausal women taking supplements may be getting too much calcium, thereby increasing their risk for kidney stones.

Information from national surveys shows

vitamin D presents a complicated picture. While the average total intake of vitamin D is below the median requirement, data from these surveys show that average blood levels of vitamin D are above the 20 nanograms per milliliter that the IOM committee found to be the level that is needed for good bone health for practically all individuals. These seemingly inconsistent data suggest that sun exposure currently contributes meaningful amounts of vitamin D to North Americans and indicates that a majority of the population is meeting its needs for vitamin D. Nonetheless, some subgroups—particularly those who are older and living in institutions or who have dark skin pigmentation—may be at increased risk for getting too little vitamin D.

Before a few years ago, tests for vitamin D were conducted infrequently. In recent years, these tests have become more widely used, and confusion has grown among the public about how much vitamin D is necessary. Further, the measurements, or cut-points, of sufficiency and deficiency used by laboratories to report results have not been set based on rigorous scientific studies, and no central authority has determined which cut-points to use. A single individual might be deemed deficient or sufficient, depending on the laboratory where the blood is tested. The number of people with vitamin D deficiency in North America may be overestimated because many laboratories appear to be using cut-points that are much higher than the committee suggests is appropriate.



## Committee to Review Dietary Reference Intakes for Vitamin D and Calcium

---

**A. Catharine Ross** (Chair)  
Professor of Nutrition and  
Occupant of Dorothy Foehr  
Huck Chair in Nutrition, Penn-  
sylvania State University

**Steven A. Abrams**  
Professor of Pediatrics, Baylor  
College of Medicine

**John F. Aloia**  
Professor, SUNY at Stony  
Brook, Chief Academic Officer,  
Winthrop-University Hospital

**Patsy M. Brannon**  
Professor, Division of  
Nutritional Sciences, Cornell  
University

**Steven K. Clinton**  
Professor, Division of Hematol-  
ogy and Oncology, The Ohio  
State University

**Ramon A. Durazo-Arvizu**  
Associate Professor, Loyola  
University Stritch School of  
Medicine

**J. Christopher Gallagher**  
Professor of Medicine, Creigh-  
ton University Medical Center

**Richard L. Gallo**  
Professor of Medicine and  
Pediatrics, University of Califor-  
nia-San Diego

**Glennville Jones**  
Head, Department of Biochem-  
istry and Professor of Bio-  
chemistry & Medicine, Queens  
University, Ontario

**Christopher S. Kovacs**  
Professor of Medicine (Endocri-  
nology), Memorial University of  
Newfoundland

**Joann E. Manson**  
Professor of Medicine and the  
Elizabeth Brigham Professor of  
Women's Health, Harvard  
Medical School

**Susan T. Mayne**  
Professor of Epidemiology and  
Public Health, Yale School of  
Public Health

**Clifford J. Rosen**  
Senior Scientist, Maine Medical  
Center Research Institute

**Sue A. Shapses**  
Professor, Department of  
Nutritional Sciences, Rutgers  
University

### Consultant

---

**Hector F. Deluca**  
University of Wisconsin-Madi-  
son

### Study Staff

---

**Christine L. Taylor**  
Study Director

**Ann L. Yaktine**  
Senior Program Officer

**Heather B. DelValle**  
Associate Program Officer

**Heather Breiner**  
Program Associate

**Anton Bandy**  
Financial Officer

**Geraldine Kennedo**  
Administrative Assistant, Food  
and Nutrition Board

**Linda D. Meyers**  
Director, Food and Nutrition  
Board

### Study Sponsors

---

Agricultural Research Service, U.S. Department of Agriculture  
Center for Nutrition Policy and Promotion, U.S. Department of  
Agriculture

Department of the Army, U.S. Department of Defense

Food and Drug Administration, U.S. Department of Health and  
Human Services

Health Canada

Office of Disease Prevention and Health Promotion, U.S.  
Department of Health and Human Services

National Institutes of Health (Division of Nutrition Research  
Coordination, National Institute on Aging, National Institute of  
Arthritis and Musculoskeletal and Skin, National Cancer  
Institute, and Office of Dietary Supplements), U.S. Department of  
Health and Human Services

Revised March 2011

## Tolerable Upper Levels of Intake

The upper level intakes set by the committee for both calcium and vitamin D represent the safe boundary at the high end of the scale and should not be misunderstood as amounts people need or should strive to consume. While these values vary somewhat by age, as shown in the table, the committee concludes that once intakes of vitamin D surpass 4,000 IUs per day, the risk for harm begins to increase. Once intakes surpass 2,000 milligrams per day for calcium, the risk for harm also increases.

As North Americans take more supplements and eat more of foods that have been fortified with vitamin D and calcium, it becomes more likely that people consume high amounts of these nutrients. Kidney stones have been associated with taking too much calcium from dietary supplements. Very high levels of vitamin D (above 10,000 IUs per day) are known to cause kidney and tissue damage. Strong evidence about possible risks for daily vitamin D at lower levels of intake is limited, but some preliminary studies offer tentative signals about adverse health effects.

## Conclusion

Scientific evidence indicates that calcium and vitamin D play key roles in bone health. The current evidence, however, does not support other benefits for vitamin D or calcium intake. More targeted research should continue. Higher levels have not been shown to confer greater benefits, and in fact, they have been linked to other health problems, challenging the concept that “more is better.”

## INSTITUTE OF MEDICINE

OF THE NATIONAL ACADEMIES

Advising the nation/Improving health

500 Fifth Street, NW  
Washington, DC 20001

TEL 202.334.2352

FAX 202.334.1412

[www.iom.edu](http://www.iom.edu)

**The Institute of Medicine serves as adviser to the nation to improve health.**

Established in 1970 under the charter of the National Academy of Sciences, the Institute of Medicine provides independent, objective, evidence-based advice to policy makers, health professionals, the private sector, and the public.

Copyright 2011 by the National Academy of Sciences. All rights reserved.