

Chapter 9—Intake of Fruits and Vegetables

9.4. CONVERSION BETWEEN WET- AND DRY-WEIGHT INTAKE RATES

The intake data presented in this chapter are reported in units of wet weight (i.e., as-consumed or edible portion uncooked fruits and vegetables consumed per day or per eating occasion). However, data on the concentration of contaminants in fruits and vegetables may be reported in units of either wet or dry weight (e.g., mg contaminant per gram dry weight of fruits and vegetables). It is essential that exposure assessors be aware of this difference so that they may ensure consistency between the units used for intake rates and those used for concentration data (i.e., if the contaminant concentration is measured in dry weight of fruits and vegetables, then the dry-weight units should be used for their intake values).

If necessary, wet-weight (e.g., as-consumed) intake rates may be converted to dry-weight intake rates using the moisture content percentages presented in Table 9-37 ([USDA, 2007](#)) and the following equation:

$$IR_{dw} = IR_{ww} \left[\frac{100 - W}{100} \right] \quad (\text{Eqn. 9-1})$$

where:

$$\begin{aligned} IR_{dw} &= \text{dry-weight intake rate,} \\ IR_{ww} &= \text{wet-weight intake rate, and} \\ W &= \text{percent water content.} \end{aligned}$$

Alternatively, dry-weight residue levels in fruits and vegetables may be converted to wet-weight residue levels for use with wet-weight (e.g., as-consumed) intake rates as follows:

$$C_{ww} = C_{dw} \left[\frac{100 - W}{100} \right] \quad (\text{Eqn. 9-2})$$

where:

$$\begin{aligned} C_{ww} &= \text{wet-weight concentration,} \\ C_{dw} &= \text{dry-weight concentration, and} \\ W &= \text{percent water content.} \end{aligned}$$

Table 9-37 presents moisture data for selected fruits and vegetables taken from [USDA \(2007\)](#).

9.5. REFERENCES FOR CHAPTER 9

- [Devaney, B; Kalb, L; Briefel, R; Zavitsky-Novak, T; Clusen, N; Ziegler, P.](#) (2004). Feeding infants and toddlers study: overview of the study design. *J Am Diet Assoc* 104: s8-13. <http://dx.doi.org/10.1016/j.jada.2003.10.023>.
- [Fox, MK; Pac, S; Devaney, B; Jankowski, L.](#) (2004). Feeding infants and toddlers study: What foods are infants and toddlers eating? *J Am Diet Assoc* 104: s22-s30. <http://dx.doi.org/10.1016/j.jada.2003.10.026>.
- [Fox, MK; Reidy, K; Karwe, V; Ziegler, P.](#) (2006). Average portions of foods commonly eaten by infants and toddlers in the United States. *J Am Diet Assoc* 106: S66-S76. <http://dx.doi.org/10.1016/j.jada.2005.09.042>.
- [Mennella, JA; Ziegler, P; Briefel, R; Novak, T.](#) (2006). Feeding Infants and Toddlers Study: the types of foods fed to Hispanic infants and toddlers. *J Am Diet Assoc* 106: S96-106. <http://dx.doi.org/10.1016/j.jada.2005.09.038>.
- [NCHS](#) (National Center for Health Statistics). (1993). Joint policy on variance estimation and statistical reporting standards on NHANES III and CSFII reports: HNIS/NCHS Analytic Working Group recommendations. Riverdale, MD: Human Nutrition Information Service (HNIS)/Analytic Working Group. Agricultural Research Service, Survey Systems/Food Consumption Laboratory.
- [Ponza, M; Devaney, B; Ziegler, P; Reidy, K; Squatrito, C.](#) (2004). Nutrient intakes and food choices of infants and toddlers participating in WIC. *J Am Diet Assoc* 104: s71-s79. <http://dx.doi.org/10.1016/j.jada.2003.10.018>.
- [Smiciklas-Wright, H; Mitchell, DC; Mickle, SJ; Cook, AJ; Goldman, JD.](#) (2002). Foods commonly eaten in the United States: Quantities consumed per eating occasion and in a day, 1994–96 [pre-publication version]. (NFS Report No. 96-5). Beltsville, MD: U.S. Department of Agriculture. <http://www.ars.usda.gov/sp2userfiles/place/12355000/pdf/portion.pdf>.
- [U.S. EPA](#) (U.S. Environmental Protection Agency). (2000). Food commodity intake database [Database].

Chapter 9—Intake of Fruits and Vegetables

- U.S. EPA** (U.S. Environmental Protection Agency). (2005). Guidance on selecting age groups for monitoring and assessing childhood exposures to environmental contaminants (final). (EPA/630/P-03/003F). Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. <http://www.epa.gov/raf/publications/guidance-on-selecting-age-groups.htm>.
- USDA** (U.S. Department of Agriculture). (1980). Food and nutrient intakes of individuals in 1 day in the United States, Spring 1977. Nationwide Food Consumption Survey 1977–78: Preliminary report no. 2. Washington, DC. http://www.ars.usda.gov/SP2UserFiles/Place/12355000/pdf/7778/nfcs7778_prelim_2.pdf.
- USDA** (U.S. Department of Agriculture). (1993). Food and nutrient intakes by individuals in the United States, 1 day, 1987–88. Nationwide Food Consumption Survey 1987–88: Report no. 87-I-1. (87-I-1). Washington, DC. http://www.ars.usda.gov/SP2UserFiles/Place/12355000/pdf/8788/nfcs8788_rep_87-i-1.pdf.
- USDA** (U.S. Department of Agriculture). (1996a). Data tables: Results from USDA's 1994 continuing survey of food intakes by individuals and 1994 diet and health knowledge survey. Riverdale, MD.
- USDA** (U.S. Department of Agriculture). (1996b). Data tables: results from USDA's 1995 Continuing survey of food intakes by individuals and 1995 diet and health knowledge survey. Riverdale, MD.
- USDA** (U.S. Department of Agriculture). (1999a). Food and nutrient intakes by children 1994–96, 1998: table set 17. Beltsville, MD. http://www.ars.usda.gov/SP2UserFiles/Place/12355000/pdf/scs_all.pdf.
- USDA** (U.S. Department of Agriculture). (1999b). Food consumption prices and expenditures (1970–1997). Statistical Bulletin, No. 965. Washington, DC: Economic Research Service.
- USDA** (U.S. Department of Agriculture). (2000). 1994–1996, 1998 continuing survey of food intakes by individuals (CSFII). Beltsville, MD: Agricultural Research Service, Beltsville Human Nutrition Research Center.
- USDA** (U.S. Department of Agriculture). (2007). USDA nutrient database for standard reference, release 20. Riverdale, MD. http://www.ars.usda.gov/main/site_main.htm?modecode=12-35-45-00.
- Vitolins, MZ; Quandt, SA; Bell, RA; Arcury, TA; Case, LD.** (2002). Quality of diets consumed by older rural adults. J Rural Health 18: 49–56.