PERSPECTIVE

Perspective: US Adult Magnesium Requirements Need Updating: Impacts of Rising Body Weights and Data-Derived Variance

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ABSTRACT

Adequate magnesium intakes are associated with lower diabetes, hypertension, and cardiovascular disease (CVD) risk but are low in modern diets. Magnesium DRIs, estimated using standard reference body weights (SRBWs) lower than current mean US adult body weights (BWs), need revision. Magnesium DRIs assume variance at 10% CV, whereas balance study data suggests 20–30% CV. Here, estimated average requirements (EARs), the DRI measure estimating average magnesium requirements for healthy adults, were corrected using 2011–2014 mean US adult BWs. Magnesium EARs (in mg magnesium/d) increased 17% for men (330–350 to 386–409) and 25% for women (255–265 to 319–332). RDAs, the DRI measure meant to cover the magnesium needs of 98% of healthy adults, were calculated using BW-corrected EARs given 3 CV levels: *1*) 10% (assumed in 1997 DRIs), *2*) 20% (model-derived variance from USDA magnesium studies), and *3*) 30% (using USDA plus older human magnesium balance data). BW-corrected magnesium RDAs (in mg magnesium/d) rose from 400–420 and 310–320 for men and women, respectively, to *1*) 463–491 and 383–398 (16.5% and 23.5% increases), *2*) 540–573 and 447–465 (35.5% and 44.5% increases), and *3*) 617–654 and 511–531 (55% and 65.5% increases). These recalculations move magnesium intakes estimated to prevent disease into ranges found in traditional diets and to intake levels shown to lower hypertension, diabetes, and CVD risk. In conclusion, mean BW rises over the last ≥20 y and data-driven estimates of CV indicate that reliable US adult magnesium RDAs are ≥60–235 and 70–210 mg magnesium/d higher for men and women, respectively, than the current 1997 RDAs. US adult BMIs are <25 kg/m^2 when calculated with SRBWs but >25 with actual mean BWs. Adjustments for rising BW are necessary for magnesium DRIs to remain useful tools for defining magnesium intake adequacy/deficiency. *Adv Nutr* 2021;12:298–304.

Keywords: human adult magnesium requirement, magnesium EAR, magnesium RDA, magnesium DRI, CV for magnesium requirement, impact of rising body weight, magnesium associated chronic diseases, hypertension, diabetes, cardiovascular disease

Introduction

Magnesium is required by so many vital processes that it would be difficult to overestimate its importance to life. Subcellularly, magnesium influences contractile proteins, modulates ion channels, acts as an essential cofactor in ATPase activation, controls metabolic regulation of energy-dependent cytoplasmic and mitochondrial pathways, regulates glycolysis, influences DNA synthesis and transcription, induces protein synthesis, and promotes cell growth (1).

Human magnesium requirements for US adults (2) are widely used in research and clinical practice to assess adequacy/deficiency of magnesium intakes. Accuracy of these magnesium DRIs is important for both research and clinical practice because low magnesium intake has been associated with several chronic diseases, including cardiovascular disease (CVD) (3), hypertension (4), type 2 diabetes (5), and others (6). Magnesium DRIs are solely dependent on measures of achieving magnesium balance, unlike the DRIs of several other essential minerals such as calcium, phosphorus, sodium, and iron, which strive to meet a physiological marker's optimal range and/or prevent disease.

In 1997, the Institute of Medicine published magnesium DRIs that include both the estimated average requirement (EAR), which estimates the mean daily magnesium need for healthy adults, and the RDA, which is derived from the EAR to estimate the daily magnesium intake that would meet the needs of 97–98% of the healthy adult population. The magnesium EARs are highly dependent on body weight (BW), as they were determined by multiplying the mean daily magnesium per kg required to achieve magnesium balance by standard reference body weights (SRBWs) set by the DRI committee. When the 1997 magnesium EARs were derived, the DRI committee set the SRBWs at 76 kg (166 lb) for men

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and 61 kg (133 lb) for women [p. 36 in (2)]. These values are well below the current mean actual BWs of US adults, which are 88.8 kg (195.7 lb) for men and 76.4 kg (168.5 lb) for women (7). The magnesium RDA is highly dependent on the CV chosen to expand the magnesium EAR to estimate the requirement of 97.5% of the healthy population. The 1997 derivation of the magnesium RDA from the EAR assumed, as per DRI protocol, a CV [CV = (SD/mean) × 100] of 10% [pp. 3 and 223 in (2)] because no reliable measure of adult magnesium requirement variance was available at that time.

A 2006 publication modeling a series of precise human magnesium balance studies suggested that the 10% CV assumed in the 1997 DRIs may be too low a variance of the adult human magnesium requirement. Hunt and Johnson (8) used a random coefficient model for 664 data points from 27 USDA magnesium balance studies, and they calculated a 95% prediction interval (PI) that translates to a CV of 20% (9). However, the 2006 Hunt and Johnson (8) magnesium balance data were predominantly (93%) from white adults, with all values in metabolic units rather than from free-living subjects; therefore, the CV estimated from these data may be conservative.

To address this concern, we calculated the mean, SD, and CV of mg of magnesium/(kg · d) to achieve magnesium balance by adding results from a wider variety of individuals reported in the literature to the Hunt and Johnson (8) data. This does not give a direct measure of the human adult magnesium requirement CV, or variance; however, it provides data-derived information with which to assess the variance assumed in the current magnesium DRIs to perhaps help determine if such research is needed. These additional data are from pre-1964 magnesium human balance studies (10) using older analytical methods, and were not used in the derivation of the 1997 DRIs for this reason. However, 2 close examinations of past versus present magnesium analytical methodology have shown this need not be a concern (11, 12).

Research since the 1997 publication of the adult magnesium requirement shows that *1*) the magnesium requirement varies with total BW (13), *2*) the mean human BW has been rising in the USA (and globally) in an obesity epidemic (14), and *3*) potentially more accurate measures

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Abbreviations used: BMI, body mass index; BW, body weight; CLMD, chronic latent magnesium deficit; CVD, cardiovascular disease; EAR, estimated average requirement; EAR_{BWCorr}, body weight-corrected estimated average requirement; EPIC, European Prospective Investigation into Cancer cohort; Mg, magnesium; Mg EAR_{BWCorr}, body weight-corrected magnesium estimated average requirement; PI, prediction interval; RDA_{BWCorr}, body weight-corrected RDA; SRBW, standard reference body weight; UL, upper limit.

TABLE 1 Calculation of Mg $Factor_{EAR}$ for US adult age/gender groups using DRI SRBW (in kilograms) and EAR[1]

Gender group/age,[2] y	EAR, mg Mg/d	SRBW,[3] kg	Mg $Factor_{EAR}$, mg Mg/(kg · d)
Men			
19–30	330	76	4.34
≥31	350	76	4.61
Women			
19–30	255	61	4.18
≥31	265	61	4.34

[1]EAR, estimated average requirement; Mg $Factor_{EAR}$, magnesium estimated average requirement factor; SRBW, standard reference body weight.
[2]Gender group and EAR are from the Institute of Medicine DRIs for magnesium [pp. 219–234 in (2)].
[3]SRBW is from the Institute of Medicine DRIs for magnesium [p. 36 in (2)].

of the CV of the adult magnesium requirement are now accessible from human magnesium balance data (8, 10). To continue to be a useful tool for defining magnesium intake adequacy/deficiency in research, clinical practice, and personal assessment, the 1997 US magnesium requirements need to be adjusted for true BW and CV measures of the population for which they were designed.

This work uses the same adult human magnesium balance data utilized by the magnesium DRIs (2) to recalculate adult magnesium EARs using current (2011–2014) mean BWs of the US adult population (7) in place of the DRI 1997 SRBWs (2). In addition, these BW-corrected EARs are used to derive BW-corrected magnesium RDAs using the 10% CV assumed by the DRIs as well as 20% and 30% CV values estimated from adult magnesium balance data. As such, these corrected values are possibly more reflective of the true CV for the magnesium requirement of healthy adults.

Methods

Calculation of the magnesium EAR factor

Using SRBWs and the EARs set by the DRIs (2) for adult age/gender groups, the magnesium EAR factor (Mg $Factor_{EAR}$) in mg of magnesium per kg BW per day was calculated for each adult age/gender group using the following formula (see **Table 1**):

$$\text{MgBW Factor}_{EAR} = \text{EAR/SRBW} \qquad (1)$$

Calculation of BW-corrected magnesium EARs

Using the magnesium EAR factor (Mg $Factor_{EAR}$) values calculated above (Table 1) and actual 2011–2014 mean adult BWs for US men and women (7), BW-corrected EARs (Mg EAR_{BWCorr}) were calculated for each adult age/gender group using the following formula (see **Table 2**):

$$EAR_{BWCorr} = \text{Mg Factor}_{EAR} \times \text{Actual Mean BW} \qquad (2)$$

Calculation of BW-corrected magnesium RDAs

According to the DRI publication (2), "the RDA is set at 2 SDs above the EAR… If data about the variability in requirements are insufficient to calculate an SD, a CV_{EAR}

TABLE 2 Calculation of BW-corrected EARs for adult age/gender groups using Mg $Factor_{EAR}$ from Table 1 and actual mean BW in place of SRBW[1]

Gender group/age, y	Mg $Factor_{EAR}$ (from Table 1), mg/(kg· d)	Actual mean BW (2011–2014),[2] kg	Mg EAR_{BWCorr}, mg Mg/d	Impact of rising BW change in EAR, %
Men				
19–30	4.34	88.8	386	+17
≥31	4.61	88.8	409	+17
Women				
19–30	4.18	76.4	319	+25
≥31	4.34	76.4	332	+25

[1] BW, body weight; EAR, estimated average requirement; Mg EAR_{BWCorr}, body weight-corrected magnesium estimated average requirement; Mg $Factor_{EAR}$, magnesium estimated average requirement factor; SRBW, standard reference body weight (see Table 1).
[2] The 2011–2014 data are from Tables 3–6 in Fryar et al. (7).

of 10% is assumed…, and the resulting equation for the RDA is:

$$RDA = EAR + 2(EAR \times 0.1) \quad (3)$$

$$RDA = EAR(1.2).\text{"(p.3)} \quad (4)$$

Using the Mg EAR_{BWCorr} for each age/gender group (Table 2), BW-corrected RDAs (Mg RDA_{BWCorr}) were calculated using the following formulae for 3 levels of CV:

1) CV = 10%: $RDA_{BWCorr} = EAR_{BWCorr}$ (1.2)
2) CV = 20%: $RDA_{BWCorr} = EAR_{BWCorr}$ (1.4)
3) CV = 30%: $RDA_{BWCorr} = EAR_{BWCorr}$ (1.6)

where *1)* CV = 10% is the CV assumed in the original DRIs, *2)* CV = 20% represents the calculated PI from data of 27 USDA magnesium balance studies [for the 2006 Hunt and Johnson results (8), magnesium balance was achieved at 2.36 mg/kg/d (95% PI: 1.58, 3.38). 3.38/2.36 = 1.43, which corresponds to CV = 20%] in human adults (8) and later used to estimate BW-corrected RDAs (9), and *3)* CV = 30% is a calculated estimate using the mean and SD of 664 USDA (8) and 289 collated (10) measures of individual adult magnesium intake (in mg per kg per day) and magnesium balance, where balance was defined as −10 to +10 mg magnesium/d and −5 to +5 mg magnesium/d (see **Supplemental Table 1**).

Results

Actual mean adult BWs compared with DRI SRBWs

The actual 2011–2014 mean adult BW for men was 88.8 kg (7), a 17% increase above their SRBW of 76 kg (2). The actual 2011–2014 mean adult BW for women was 76.4 kg (7), a 24% increase above their SRBW of 61 kg (2).

BW-corrected EARs

The magnesium EARs for US adults, recalculated using DRI methodology with actual mean BWs of the population rather than the SRBWs set by the DRIs, are 386–409 mg magnesium/d for men (compared with 330–350 mg magnesium/d) and 319–332 mg magnesium/d for women (compared with 255–265 mg magnesium/d) (see Table 2 and **Figure 1**A).

BW-corrected RDAs

CV = 10%. BW-corrected adult RDAs with the DRI-assumed 10% CV are in the range of 463–491 mg magnesium/d for men (compared with 400–420 mg magnesium/d) and 383–398 mg magnesium/d for women (compared with 310–320 mg magnesium/d) (see **Table 3** and Figure 1B). These BW-corrected RDAs show increases of 16–17% and 23–24% for men and women, respectively, similar to the increases seen in actual BWs and BW-corrected EARs. These are the rises in RDA considering actual rise in BW alone (i.e. retaining the 10% CV assumed in DRI).

CV = 20%. The 10% CV assumed in the 1997 DRIs may be too low a variance of the adult human magnesium requirement. Hunt and Johnson (8) used a random coefficient model for 664 data points from 27 USDA magnesium balance studies to predict neutral magnesium balance at intakes of 165 mg/d [95% PI: 113, 237 (237 mg magnesium/d predicts magnesium balance for 95% of subjects, where 165 mg magnesium/d is the mean. 237/165 = 1.43, which translates to a CV of 20%)], and this conclusion translates to a measured CV of 20% (9). When using this 20% CV for the calculation of RDAs from the BW-corrected EARs for each age/gender group, the BW-corrected RDAs rise into the range of 540–573 mg magnesium/d for men and 447–465 mg magnesium/d for women, that is, increases of 35–36% for men and 44–45% for women (see Table 3 and Figure 1B).

CV = 30%. An approximate CV of 30% was calculated using intake data in mg of magnesium per kg per day with corresponding magnesium balance values for 238 data points extracted from Seelig (10) added to the 664 USDA data values of Hunt and Johnson (8) (FH Nielsen and L Johnson 2019, personal communication). Values from *these* 2 sets of data were used to calculate the mean magnesium intake per kg of BW where magnesium balance was achieved, defining magnesium balance as −10 to +10 mg/d and −5 to +5 mg/d. Using this rendition of the data points, the mean and SD were derived using Excel, and the CV for each group was calculated. The results are presented in Supplemental Table 1. When using this 30% value for CV, the RDAs range even higher, that is, into the range of 617–654 mg magnesium/d for men (a 54–56% increase) and 511–531 mg magnesium/d for women (a 65–66% increase) (see Table 3 and Figure 1B).

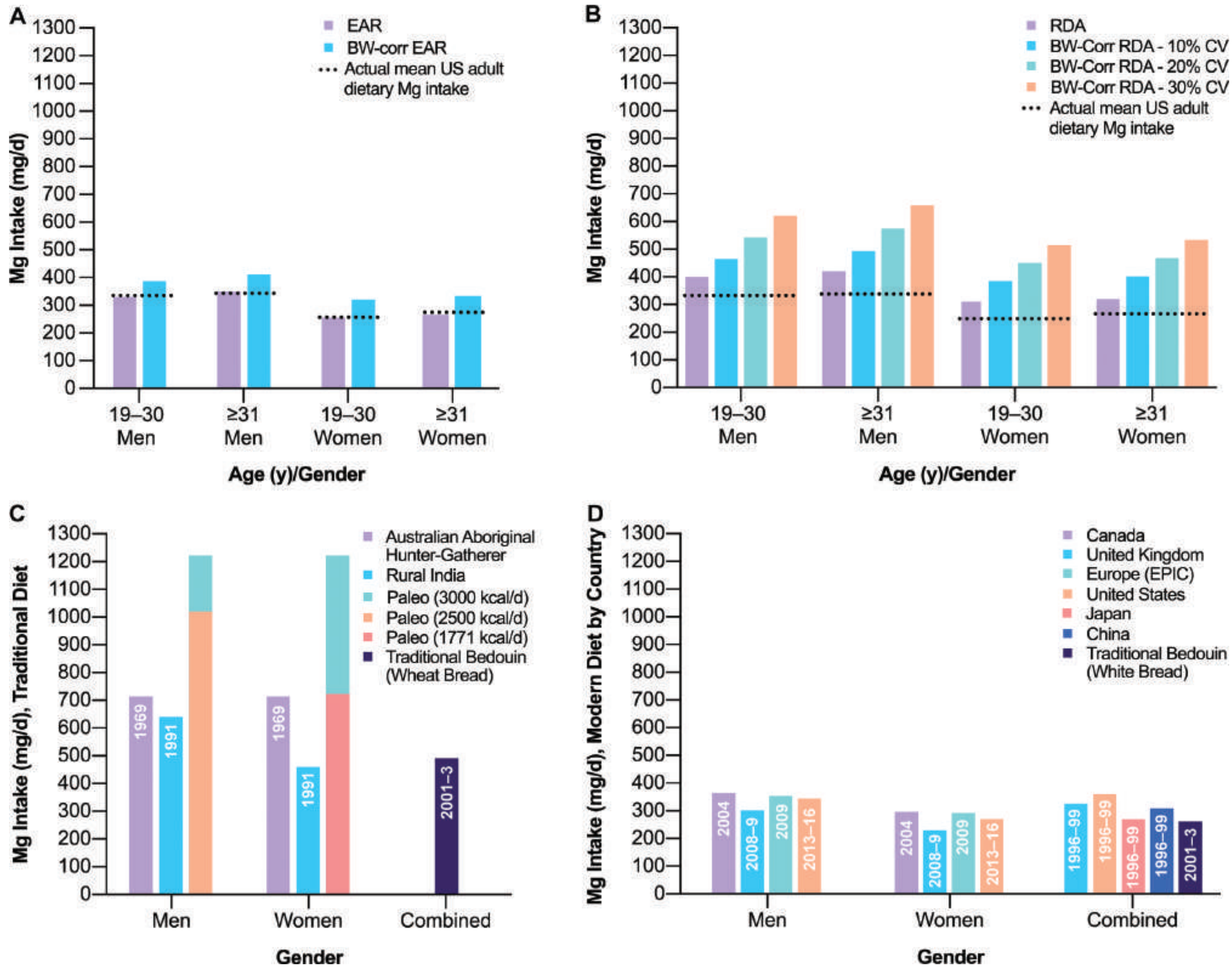

FIGURE 1 (A) Magnesium EAR and BW-corrected EAR for adult men and women. (B) Magnesium RDA and BW-corrected RDA for adult men and women at 3 levels of CV. Data for A and B are from the Institute of Medicine (2) and USDA (15). (C) Measured mean magnesium intakes of adults in traditional societies. Data are from Smith and Smith (16), Kapil et al. (17), Abu-Saad et al. (18), Wright and Wang (19), and Eaton and Eaton (20). (D) Measured mean magnesium intakes of adults in modern societies. Data are from Abu-Saad et al. (18), Health Canada (21), Bates et al. (22), Welch et al. (23), USDA (15), and Van Horn et al. (24). In C and D, years indicate the data collection year where available; "combined" indicates that data were not separated by gender (see Supplemental Table 2 for further details). BW, body weight; EAR, estimated average requirement; EPIC, European Prospective Invetigation into Cancer; Mg, magnesium.

These latter 2 recalculations of RDAs (at 20% and 30% CV) represent the impacts of both rising actual BW as well as possible higher variance from data-derived sources.

Impact of rising BW

The actual 2011–2014 BW was 17% higher for men and 25% higher for women than the SRBW used in the 1997 magnesium DRIs. The recalculated BW-corrected EARs and RDAs using 10% CV showed the same increases (i.e. 17% and 25% higher for men and women, respectively). Using actual mean heights for this population (7), BMI calculated using DRI SRBW was <25 kg/m^2 (24.6 for men and 23.3 for women), and BMI calculated using actual mean BW was >25 (28.8 for men and 29.2 for women) for the adult US population (see **Table 4**).

Impact of rising CV

Using the 1997 EARs (not BW corrected) with 20% CV, calculated RDAs showed 15–17% increases for both men and women. At 30% CV, the non-BW-corrected RDAs showed increases of 32–33% for both genders (data not shown).

Figure 1, A and B, shows the results of these BW-corrected EARs and BW- and variance-corrected RDA calculations, along with actual US adult mean magnesium intakes (15), which are compared with measured adult mean magnesium intakes in traditional societies (Figure 1C) (16–20) and modern societies (Figure 1D; **Supplemental Table 2**) (15, 18, 21–24). Table 4 shows the increases in magnesium intake that these BW- and variance-corrected RDAs recommend above that of the current DRI RDAs (3–5, 25)

TABLE 3 Calculation of BW-corrected RDAs for adult age/gender groups[1]

Gender group/age, y	RDA, mg Mg/d	EAR_{BWCorr},[2] mg Mg/d	RDA_{BWCorr}, mg Mg/d 10% CV	20% CV	30% CV
Men					
19–30	400	386	463 (+16%)	540 (+35%)	617 (+54%)
≥31	420	409	491 (+17%)	573 (+36%)	654 (+56%)
Women					
19–30	310	319	383 (+23%)	447 (+44%)	511 (+65%)
≥31	320	332	398 (+24%)	465 (+45%)	531 (+66%)

[1]BW, body weight; EAR, estimated average requirement; EAR_{BWCorr}, body weight-corrected estimated average requirement; RDA_{BWCorr}, body weight-corrected RDA.
[2]Calculated in Table 2.

Discussion

Magnesium intakes in modern societies, including the USA, are slightly but generally lower than current EAR-suggested magnesium requirements (Figure 1A, D); however, they are well below measured magnesium intakes in traditional societies and the recalculated RDAs described in this article (Figure 1B, C).

Mean magnesium intakes in the US population have been lower than the 1997 magnesium EARs, especially among elderly persons and teens (26), long enough for magnesium to be deemed an underconsumed nutrient in the 2015 Dietary Guidelines for Americans (27). Actual 2013–2016 mean magnesium intakes of US adults (15) at 340–344 mg magnesium/d for men and 256–273 mg magnesium/d for women are quite close to the current EARs as shown in Figure 1A. By NHANES analysis, 50–55% of US adults overall fall short of meeting the current magnesium EARs (15), close to the desired 50%. However, these magnesium intake shortfalls rise to >50–75% using the BW-corrected EARs calculated in Table 2, strongly suggesting that current usual intakes are not adequate to prevent magnesium deficits in US adults given rises in BWs above the SRBWs of the 1997 DRIs. This prediction is borne out by the ∼49% of the US adult population with hypertension (28) and the fact that although new cases of diabetes in US adults have been decreasing since 2008, ∼33% of US adults have prediabetes (29). Additionally, heart diseases remain the leading cause of death among US adults (30).

Actual mean magnesium intake in US adults is ∼82–85% of the current RDAs (see Figure 1B). These actual magnesium intakes are only ∼70% of the BW-corrected RDAs (10% CV) and as low as 50% of the BW- and CV-corrected RDAs (30% CV) described in this article (Figure 1B). The 1997 RDAs of 310–420 mg magnesium/d fall below the range of measured magnesium intakes found in traditional diets, which range from 490 to ≥713 mg magnesium/d (Figure 1C); however, the BW-recalculated RDAs in Table 3, even at the high 30% CV, fall well within the intake range of these traditional diets (Figure 1B versus 1C).

Table 4 puts into context the possible health impact of magnesium intake increases of these BW- and variance-corrected RDAs if they were to be adopted. They compare well with the range of increased magnesium intakes of the

TABLE 4 Magnesium increases in BW-corrected RDAs recalculated at 3 levels of CV compared with research findings of increased magnesium intakes associated with improved risks of chronic disease[1]

Parameter (reference)	Men 19–30 y	Men ≥31 y	Women 19–30 y	Women ≥31 y
BMI, kg/m²				
SRBW[2]	24.6	24.6	23.3	23.3
Actual BW[2]	28.8	28.8	29.2	29.2
Magnesium intake, mg/d				
RDA, current DRI	400	420	310	320
Increase from DRI-RDA to BW-corrected RDA				
10% CV	+63	+71	+73	+78
20% CV	+140	+153	+137	+145
30% CV	+217	+234	+201	+211
Amounts of additional dietary magnesium intakes showing lower risks of chronic disease				
DASH target diet (500 mg Mg/d) (25)	+100	+80	+190	+180
Dietary Mg increase associated with significantly lower FG and FI (5)	+50 (all groups)			
Dietary Mg increase associated with 5% lower risk of hypertension (4)	+100 (all groups)			
Dietary Mg increase associated with 22% lower risk of IHD, 27% lower IHD mortality, and a trend toward lower CVD (3)	+200 (all groups)			

[1]BMI, body mass index; BW, body weight; CVD, cardiovascular disease; DASH, Dietary Approaches to Stop Hypertension; EAR, estimated average requirement; FG, fasting glucose; FI, fasting insulin; IHD, ischemic heart disease; Mg, magnesium; SRBW, standard reference body weight.
[2]Using actual mean heights of 175.7 cm for males and 161.8 cm for females (7).

Dietary Approaches to Stop Hypertension diet (25) and the range of increased magnesium intakes found to significantly lower risk factors for type 2 diabetes (5) and hypertension (4). They also fall well within the dietary magnesium increase associated with 22% lower ischemic heart disease and trending lower CVD (3).

One question for consideration is whether these suggested magnesium intake values are too high, considering the 350 mg/d adult upper limit (UL) for magnesium established by the DRIs. A careful reading of the "tolerable upper intake levels" section of the 1997 DRI monograph on magnesium (2) shows there really is no conflict. The authors of the 1997 magnesium DRI followed guidelines of the DRI and set the magnesium UL at the level of supplementary magnesium where *any* symptoms in *any* person occurs. This concentration was 350 mg supplemental magnesium/d; some individuals (but not all) who consumed this amount had very mild, temporary, and fully reversible side effects (mostly diarrhea). To note, the UL of 350 mg supplemental magnesium/d for humans aged >8 y is only for magnesium supplements; to date, no evidence of harm has been shown for high naturally occurring magnesium intakes from food or magnesium fortificants taken with foods, even when large amounts are ingested. Magnesium intakes with food in the 500–700 mg/d range, predicted as the proper range for adults in the current study, were safely consumed among traditional diets (see Figure 1C) and are safely consumed among the highest magnesium intakes in modern societies (5). This 350 mg/d UL is above the 255–310 mg supplemental magnesium/d needed to increase current adult mean magnesium intakes to the highest BW- and CV-corrected RDAs in Table 3. Very high intakes of magnesium supplements can be dangerous, even to people without renal or intestinal disease, but such concentrations of magnesium supplement intake are ≥10-fold higher than the additional amounts discussed in this article [see pp. 242–247 in (2); (31)], which are in the range of ≥5000 mg magnesium/d (32).

Yet, are these the true magnesium requirements for healthy adults? Balance studies are the core of the magnesium factors calculated in Table 1, and they are thus central to both the EARs and resultant RDAs in the DRI estimation process for magnesium requirements. Balance studies consider digestive tract absorption and kidney excretion as the points of physiological magnesium homeostasis; they do not consider translocation of magnesium body stores, especially bone. This third point of magnesium homeostasis has long been discussed [see pp. 240–241 in (2); (33–35)] but was only recently accepted as part of the usual physiology of magnesium homeostasis (36). It is possibly a part of the development of chronic latent magnesium deficit (CLMD) in a population largely consuming suboptimal amounts of magnesium (26) (i.e. most modern societies; Figure 1D). A person with CLMD shows serum magnesium in the normal range and can show magnesium balance in balance studies; however, these individuals show a marked retention of a magnesium load in a magnesium load test (37, 38). Magnesium load tests are cumbersome and not standardized, and we do not know the extent of CLMD in the USA or other populations. In addition, the mean BWs of US adults are rising each year (39). It could be that a true magnesium requirement will need to take into account prevention (and possibly correction) of CLMD as well as encompass the reality of rising BWs in modern societies.

With regard to other nutrients, this exercise strongly suggests that any other essential nutrients dependent on either BW or variance in their DRI estimations should be re-examined for their reliability to express true requirements for the healthy population to prevent deficits in diverse populations experiencing rising BWs in these changing times. Investigation into which essential nutrients fall into either of these categories would most likely be a worthwhile endeavor.

If these recommendations were followed in personal practice and clinical settings, there would presumably be less risk of type 2 diabetes, hypertension, and heart disease in the US adult population (see Table 4). Were the EARs and RDAs recommended here used in research to assess magnesium status, assessments of magnesium deficit among populations would increase. For example, Kass et al. (40) found that the mean magnesium intake of the general UK adult population was 64–69% of the DRI RDAs. If the RDAs recalculated in the present study are used, this figure decreases to the UK general adult population mean magnesium intake being only 57% of the BW-corrected RDA and <50% of the BW- and CV-corrected RDAs. Unfortunately, modern magnesium research studies, which are mostly performed on populations who consume modern diets (see Figure 1D), are actually comparing "low to moderate" magnesium intakes with "lower" magnesium intakes. For example, the quintiles in Hruby et al. (5) show that only the highest quintile of magnesium intake (356–651 mg magnesium/d) falls within the range of the BW- and variance-corrected RDAs of the current study. In other words, most of the population (the lower 4 quintiles) in the Hruby et al. (5) study had magnesium intakes that fell below this recommended range and even the current recommended range, with intakes of only 101–356 mg magnesium/d for 80% of both men and women. Many magnesium studies on modern societies are thus comparing "low" with "lower" magnesium intakes, and they do not include comparisons with truly adequate magnesium intakes that can protect 98% of healthy adults from magnesium deficits by falling in the range described with these BW- and variance-corrected RDAs. Thus, the degree of magnesium deficit and its adverse impacts are underestimated in modern populations, and we continue to overlook this essential, safe mineral as an effective possibility for lowering the risks of chronic disease in humans.

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