

A growing body of work suggests an importance for Ca:Mg ratio. We calculated the change of Ca:Mg intake from foods over time in the United States of America.

**Method:** U.S. Department of Agriculture Food Surveys from 1977, 1985, 1994, 2001-2, 2003-4, and 2005-6 provided mean Ca, Mg and Kcal intake per day in adult age-gender groups. (USDA Surveys before 1977 do not include Mg; Data for adults age 50+ were not reported until 1994; Defined age/gender groups changed slightly for age from survey to survey.) Survey means were used to calculate % changes in Ca, Mg, Kcal, and Ca:Mg intakes from food for 1977 to 2006 (1994 – 2006 for age 50+ yrs).

**Results:** Mean Ca daily intake rose in each age/gender group: a low of 21% for elderly males and a high of 77% for adult females. Mean Mg daily intakes rose in each adult age-gender group, but to a lesser extent than Ca, from 3% for elderly males and a high of 28% in adult females. Caloric intakes rose in each age/gender group comparable to the rise in Mg rather than to the rise in Ca: 7% for elderly males and 28% for adult females. **Conclusion:** Large rises in Ca intakes between 1977 and 2005-6 result in an apparent rising Ca:Mg from food, observed from 1977 to 2005-6 for each adult age-gender group; 20 – 38% rise for adult women and 18 – 32% rise for adult men. *Supported by Center for Magnesium Education & Research.*

# Possible Rise In Ca:Mg Ratio From Food Intake in U.S.A. Adults

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## METHODS – 2

**Tables 1, 2 & 3:**

Mean Ca intakes (mg/day)

Mean Mg intakes (mg/day)

Mean energy intakes (kcal/day)

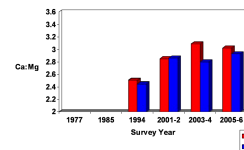
were tabulated using above age-gender groups for each survey;

Then % rise in mean Ca, mean Mg & mean energy intakes were calculated using the formula:

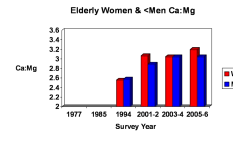
$$\% \text{ rise} = [(2005-6 \text{ value minus } 1977 \text{ (or } 1994) \text{ value)} / 1977 \text{ value}] \times 100$$

## METHODS – 3

**Ca:Mg Intake from Foods**  
over 12 years



**Ca:Mg Intake from Foods**  
over 12 years



## Introduction

### Importance of Ca:Mg

**Cellular Ratio has been functionality established**

- Wacker and Williams, 1968
- Resnick, L. M. 1992

**Physiological/Medical ratio has shown some reporting**

- DMT2 & Hypertension
- Kidney stones
- Heart Disease
- Depression

**Nutritional ratio has been hinted**

- Durlach, 1989 Recommends ratio = 2.0
- Colorectal Cancer
- Dai, 2007, 2009 crucial Ca:Mg ratio = 2.78

This study was an attempt to ascertain Dietary Ca:Mg over time in USA adults.

### METHODS - 1

USDA Food & Nutrient Intake Surveys Provided Mean Daily Mg & Ca intakes (& variance) for various age-gender groups for the following years:

- 1977
- 1985
- 1994
- 2001-2
- 2003-4
- 2005-6

These Surveys varied in their definitions of age-gender groups for reported mean intake values. Thus, the groups are not fully age-comparable. The following categories were designated for comparison in this study:

	Young Adults	Adults	Mature Adults	Elderly
1977	19-34	35-50	Not Reported	Not Reported
1985	19-34	35-50	Not Reported	Not Reported
1994	19-30	31-50	51-70	>70
2001-2	20-29	30-49	50-69	>70
2002-3	20-29	30-49	50-69	>70
2005-6	20-29	30-49	50-69	>70

**Table 1.** Calcium mean intake (mg/day) from food in USA, 1977 – 2006 in comparable gender-age groupings<sup>1</sup>

Year	Young Adults	Adults	Mature Adults	Elderly	Young Adults	Adults	Mature Adults	Elderly
1977	611	515			811	736		
1985	683	606			975	889		
1994	697*	617	599	536	1013	913	788	729
2001-2	688	771	706	614	1088	1029	888	794
2003-4	686	786	716	712	1202	1085	957*	811
2005-6	613	909	791	712	1387*	1162	991	881
% Rise	50%	77%			77%	56%		

Notes: blank cells, data not available \*decrease from previous year(s) survey(s) – 3/40 cells. All other values are an increase. 1. Age ranges for these surveys are tabulated above in Table 1

**Table 2.** Magnesium m mean intake (mg/day) from food in USA, 1977 – 2006, in comparable gender-age groupings<sup>1</sup>

Year	Young Adults	Adults	Mature Adults	Elderly	Young Adults	Adults	Mature Adults	Elderly
1977	213	237			301	315		
1985	214	239*			318	328		
1994	219*	236	238	209	342	341	301	282
2001-2	236	309	246	213	329*	349*	308	276*
2003-4	242	344*	256*	235	338	344	301*	273*
2005-6	251	384	262	235	327*	377	339	309
% Rise	19%	38%			8%	30%		

Notes: blank cells, data not available \*decrease from previous year(s) survey(s) - 10/40 cells. 1. Age ranges for these surveys are tabulated above in Table 1

**Table 3.** Calorie mean intake (kcal/day) from food in USA, 1977 – 2006, in comparable gender-age groups<sup>1</sup>

Year	Young Adults	Adults	Mature Adults	Elderly	Young Adults	Adults	Mature Adults	Elderly
1977	1617	1514			2423	2393		
1985	1787	1602			2667	2428		
1994	1828	1678	1539	1377	2884	2766*	2179	1854
2001-2	2005	1948	1692	1437	2961	2804	2133	1889
2003-4	2109	1960*	1694	1548	2969	2808	2232*	1868*
2005-6	2199*	1999*	1671*	1499*	3011*	2830*	2314	1984
% Rise	27%	26%			37%	39%		

Notes: blank cells, data not available \*decrease from previous year(s) survey(s) – 10/40 cells. 1. Age ranges for these surveys are tabulated above in Table 1

### Findings

For all age-gender groups Ca intake rose over time 9% to 77%

Mg intake rose over time -5 to 28%

Resulting in a rising Ca:Mg for all age-gender groups

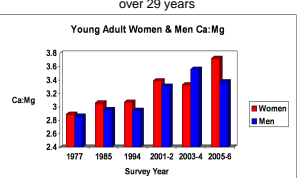
## METHODS – 3

Ca:Mg ratio calculated for each age-gender group for each survey year:

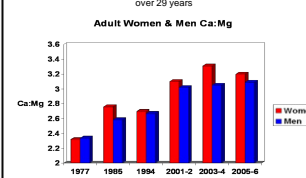
$$\text{Ca:Mg} = \text{Mean Ca intake (mg/day)} / \text{Mean Mg intake (mg/day)}$$

Ca:Mg ratios charted for each age-gender group by survey year:

**Ca:Mg Intake from Foods**  
over 29 years



**Ca:Mg Intake from Foods**  
over 29 years



## IS THIS REAL?

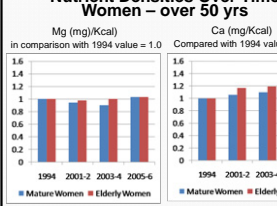
### Is This Real? Findings

Assessment Methods Improved 1977 – 2006

- Artifact?
- Caloric intake rise in all age-gender groups
- Comparable to % rise in Mg
- \* marks on Tables 1, 2, & 3

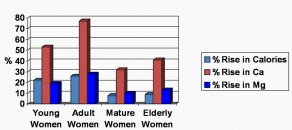
Nutrient Densities for Ca & Mg calculated and charted below:

**Food Intake Nutrient Densities Over Time Women – over 50 yrs**



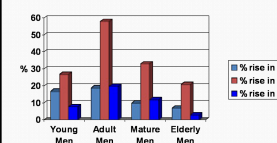
### Is This Real?

% Rise in Calories, Ca, Mg: 1977 - 2006, USA Women



### Is This Real?

% Rise in Calories, Ca, Mg: 1977 - 2006 USA Men



### Findings

The Ca:Mg dietary intake ratio may be rising in U.S.A. adults – Due to a rise in Ca intake from foods

Need to revisit data and calculate individual Ca:Mg dietary ratios and perform statistical analysis

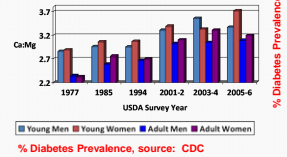
## SO WHAT?

Both Crude & Age-Adjusted Incidence of Diabetes showed a sharp rise in the U.S. population, beginning in the 1990's after remaining steady throughout the 1980's, rising 132% from 3% to about 5.8%.

Source: Center for Disease Control, CDC.gov

**Cam from Food Over Time + Diabetes Prevalence**

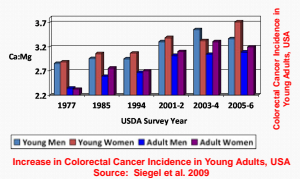
U.S.A. Men & Women aged 19 - 50 yrs



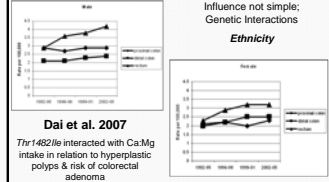
## So What?

- Colorectal Cancer associated with Diabetes
- Ren et al. 2009 – 170 countries
- Limburg et al. 2007
- Colorectal Cancer: increase in USA, 1992 – 2005
- 20 – 50 yrs
- Siegel et al. 2009

**Ca:Mg from Food Over Time + Increase in colorectal cancer incidence U.S.A. Men & Women aged 19 - 50 yrs**



**Ca:Mg intake & risk of colorectal adenoma**



## Supplement Sales in USA, 2007

- Calcium Supplements: \$262,092,000
- Magnesium Supplements: \$19,031,740

## CONCLUSIONS

- Suggest that Physiology & Nutrition Research include Ca:Mg calculations when reporting results.
- Just as Ca:Mg is functionally determinative at the cellular level
- It appears to be functionally determinative at the Long Term Physiological level that is
- At least partially dependent upon the Nutritional dietary intake ratio
- **which may be rising in populations on a largely processed food diet.**