Dietary Sources of Phosphorus among Adults in the United States: Results from NHANES 2001–2014

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Table S1. Crude and age/sex adjusted estimated values with 95% CI’s for total dietary calories for adults 20 years of age or older for NHANES WWEIA 2001–2014.

| Population Subgroup | Calories (kcal/day) | Crude      | Adjusted   |
|---------------------|---------------------|------------|------------|
| All                 | 2182 (2166–2198)    | 2170 (2153–2187) |
| Male (REF)          | 2578 (2553–2604)    | 2557 (2533–2582) |
| Female              | 1813 (1799–1827) ** | 1811 (1796–1826) ** |
| NH White (REF)      | 2218 (2199–2237)    | 2186 (2165–2207) |
| NH Black            | 2153 (2120–2187) ** | 2155 (2115–2195) ** |
| Mexican American    | 2128 (2093–2162) ** | 2237 (2198–2276) ** |
| Other               | 2008 (1975–2040) ** | 2033 (1997–2069) ** |
| 20–29 (REF)         | 2390 (2349–2431)    | 2382 (2341–2423) |
| 30–49               | 2325 (2300–2349) ** | 2319 (2293–2345) ** |
| 50–69               | 2032 (2005–2058) ** | 2032 (2004–2060) ** |
| 70+                 | 1690 (1668–1712) ** | 1703 (1679–1726) ** |

** p < 0.01, n.s. p ≥ 0.05, bold = more than 5% different than the reference group; Adjusted values are age and sex standardized to the 2000 US Census population. NH = Non-Hispanic.

Table S2. Estimated Total Dietary Phosphorus (mg/day) by USDA Food Groups in NHANES WWEIA 2013–2014 in adults 20 years of age or older.

| Food Group                        | All    | Male   | Female | NH White | NH Black | Mexican American | Other     | 20–29 | 30–49 | 50–69 | 70+   |
|-----------------------------------|--------|--------|--------|----------|----------|------------------|----------|-------|-------|-------|-------|-------|
| Milk & Milk Products              | 251    | 287    | 217    | 286      | 159      | 196              | 194      | 273   | 239   | 244   | 271   |
| Meat, Poultry, Fish & Mixtures    | 355    | 427    | 288    | 345      | 441      | 309              | 365      | 377   | 383   | 340   | 284   |
| Eggs                              | 50     | 59     | 42     | 47       | 57       | 66               | 50       | 55    | 49    | 50    | 48    |
| Legumes, Nuts and Seeds           | 69     | 79     | 60     | 66       | 53       | 88               | 83       | 53    | 75    | 75    | 60    |
| Grain Products                    | 435    | 497    | 375    | 417      | 379      | 633              | 431      | 499   | 466   | 399   | 340   |
| Fruits                            | 29     | 30     | 27     | 27       | 28       | 39               | 31       | 25    | 28    | 28    | 38    |
| Vegetables                        | 89     | 96     | 82     | 93       | 90       | 71               | 82       | 86    | 88    | 89    | 94    |
| Fats, Oils & Salad Dressings      | 7      | 7      | 7      | 7        | 10       | 7                | 6        | 8     | 7     | 6     | 6     |
| Sugar, Sweeteners & Beverages     | 115    | 142    | 89     | 121      | 90       | 133              | 90       | 139   | 124   | 109   | 64    |
| All Source                        | 1399   | 1625   | 1187   | 1410     | 1306     | 1542             | 1332     | 1515  | 1461  | 1340  | 1205  |

NH = Non-Hispanic.
Table S3. Estimated Phosphorus Density Ratio (mg·P/kcal) by USDA Food Groups in NHANES WWEIA 2013–2014 in adults 20 years of age or older.

| Food Group                  | All     | Male    | Female   | NH White | NH Black | Mexican American | Other | 20–29 | 30–49 | 50–69 | 70+   |
|-----------------------------|---------|---------|----------|----------|----------|-------------------|-------|-------|-------|-------|-------|
| Milk & Milk Products        | 1.217   | 1.235   | 1.195    | 1.227    | 1.180    | 1.256             | 1.15  | 1.281 | 1.165 | 1.223 | 1.243 |
| Meat, Poultry, Fish & Mixtures | 0.924   | 0.915   | 0.936    | 0.941    | 0.854    | 0.901             | 0.938 | 0.901 | 0.937 | 0.924 | 0.923 |
| Eggs                        | 1.023   | 1.031   | 1.012    | 1.030    | 1.012    | 0.985             | 1.036 | 1.006 | 1.011 | 1.032 | 1.066 |
| Legumes, Nuts and Seeds     | 0.790   | 0.793   | 0.787    | 0.778    | 0.780    | 0.848             | 0.808 | 0.829 | 0.820 | 0.768 | 0.724 |
| Grain Products              | 0.553   | 0.560   | 0.544    | 0.543    | 0.513    | 0.651             | 0.551 | 0.573 | 0.564 | 0.534 | 0.534 |
| Fats, Oils & Salad Dressings| 0.132   | 0.124   | 0.140    | 0.116    | 0.188    | 0.180             | 0.147 | 0.162 | 0.149 | 0.119 | 0.086 |

NH = Non-Hispanic.

Table S4. Proportion of total dietary phosphorus contributed by types of food for adults aged 20 and older from NHANES-WWEIA 2013–2014.

| Food Category          | All     | Male    | Female   | NH White | NH Black | Mexican American | Other | 20–29 | 30–49 | 50–69 | 70+   |
|------------------------|---------|---------|----------|----------|----------|-------------------|-------|-------|-------|-------|-------|
| Beverages—100% Juice   | 0.88%   | 0.89%   | 0.87%    | 0.77%    | 1.27%    | 1.20%             | 0.91% | 0.82% | 0.80% | 0.74% | 1.72% |
| Beverages—Alcoholic    | 1.99%   | 2.67%   | 1.10%    | 2.11%    | 2.19%    | 1.88%             | 1.29% | 2.22% | 2.19% | 1.98% | 0.79% |
| Beverages—All Other    | 3.28%   | 3.10%   | 3.53%    | 3.44%    | 2.79%    | 2.71%             | 3.33% | 3.70% | 3.14% | 3.33% | 2.79% |
| Beverages—Coffee/Tea   | 1.65%   | 1.42%   | 1.94%    | 1.84%    | 1.08%    | 1.08%             | 1.57% | 1.22% | 1.98% | 1.65% | 1.34% |
| Dairy—Mills            | 7.84%   | 8.31%   | 7.23%    | 8.84%    | 4.68%    | 6.03%             | 6.73% | 8.61% | 6.78% | 7.47% | 11.23%|
| Dairy—Other            | 7.90%   | 7.26%   | 8.74%    | 9.04%    | 5.92%    | 5.41%             | 5.69% | 7.29% | 7.38% | 8.81% | 8.09% |
| Fruits and Vegetables—Excluding Potatoes | 3.54%   | 2.93%   | 4.31%    | 3.64%    | 3.21%    | 2.46%             | 4.11% | 2.60% | 3.33% | 3.93% | 4.90% |
| Fruits and Vegetables—White Potatoes | 2.22%   | 2.28%   | 2.14%    | 2.36%    | 2.64%    | 1.61%             | 1.63% | 2.14% | 2.21% | 2.22% | 2.39% |
| Grains—Breads          | 7.19%   | 7.17%   | 7.21%    | 6.64%    | 7.02%    | 10.56%            | 7.47% | 5.66% | 7.30% | 7.61% | 8.49% |
| Grains—Cooked Grains/Cereals | 1.96%   | 1.73%   | 2.27%    | 1.59%    | 2.26%    | 1.30%             | 4.12% | 1.22% | 2.06% | 2.01% | 2.97% |
| Grains—RTE Cereals     | 2.00%   | 2.01%   | 1.99%    | 2.41%    | 1.24%    | 1.15%             | 1.19% | 1.44% | 1.40% | 2.37% | 4.11% |
| Mixed Dishes—Asian     | 1.49%   | 1.39%   | 1.63%    | 1.29%    | 1.02%    | 1.16%             | 3.17% | 1.77% | 1.56% | 1.46% | 0.83% |
| Mixed Dishes—Grain-Based | 3.39%  | 3.42%   | 3.35%    | 3.38%    | 4.41%    | 2.23%             | 3.49% | 3.39% | 2.98% | 3.91% | 3.16% |
| Mixed Dishes—Meat, Poultry, Seafood | 3.80%  | 3.80%   | 4.03%    | 4.13%    | 4.12%    | 2.69%             | 3.46% | 2.64% | 3.47% | 4.87% | 4.88% |
| Mixed Dishes—Mexican   | 4.99%   | 5.19%   | 4.73%    | 4.04%    | 2.08%    | 14.80%            | 4.62% | 6.69% | 6.05% | 3.68% | 1.96% |
| Mixed Dishes—Pizza     | 4.49%   | 4.64%   | 4.29%    | 4.52%    | 4.67%    | 3.55%             | 4.89% | 7.89% | 4.99% | 2.76% | 1.33% |
Table S5. Mean daily dietary calcium intake from foods and beverages and dietary calcium to phosphorus ratio for U.S. adults 20 years of age or older and according to NHANES WWEIA survey cycle.

| NHANES WWEIA Survey Cycle | N (Unweighted) | Mean Dietary Calcium (95% CI) (mg/day) | Dietary Calcium to Phosphorus Ratio (95%CI) (mg Ca/mg P) |
|---------------------------|---------------|----------------------------------------|--------------------------------------------------------|
| Overall                   | 34,741        | 946 (934–959)                          | 0.689 (0.685–0.694)                                   |
| 2001–2002                 | 4744          | 870 (834–906)                          | 0.652 (0.640–0.663)                                   |
| 2003–2004                 | 4448          | 885 (849–921)                          | 0.664 (0.648–0.680)                                   |
| 2005–2006                 | 4520          | 966 (932–1001)                         | 0.711 (0.698–0.724)                                   |
| 2007–2008                 | 5419          | 933 (887–979)                          | 0.707 (0.691–0.722)                                   |
| 2009–2010                 | 5762          | 1019 (1000–1038)                       | 0.724 (0.716–0.731)                                   |
| 2011–2012                 | 4801          | 997 (967–1028)                         | 0.703 (0.690–0.715)                                   |
| 2013–2014                 | 5047          | 970 (948–993)                          | 0.694 (0.685–0.703)                                   |
| Change                    |               | 11.49%                                 | 6.44%                                                  |
| p-Value for Trend *       |               | <0.01                                  | <0.01                                                 |

* p-Values are calculated from a survey weighted linear regression modeling survey cycle ordinally adjusted for race, age, and sex.
Table S6. Crude and age adjusted estimated means (95% CIs) for total dietary calcium intake from foods and beverages and dietary calcium to phosphorus ratio for adults 20 years of age or older, NHANES WWEIA 2001–2014.

| Population Subgroup | Unweighted N | Mean Total Dietary Calcium (mg/day) | Mean Dietary Calcium to Phosphorus Ratio (mg Ca/mg P) |
|---------------------|--------------|-----------------------------------|-----------------------------------------------|
|                     | Crude Adjusted |                      | Crude Adjusted |                      |
| All                 | 34,741        | 946 (934–959)             | 951 (938–963)               | 0.689 (0.685–0.694) | 0.694 (0.690–0.699) |
| Male (REF)          | 16,806        | 1066 (1050–1083)          | 1074 (1057–1092)            | 0.721 (0.714–0.727) | 0.722 (0.716–0.729) |
| Female              | 17,935        | 833 (822–848)**                                | 836 (823–849)**                   | 0.672 (0.665–0.679) | 0.711 (0.705–0.717) |
| NH White (REF)      | 16,569        | 989 (973–1005)             | 1003 (987–1019)             | 0.705 (0.699–0.711) | 0.711 (0.705–0.717) |
| Mexican American    | 5914          | 776 (756–795)**                                | 775 (757–793)**                   | 0.640 (0.631–0.650)** | 0.642 (0.633–0.652)** |
| Other               | 5045          | 834 (810–859)**                                | 828 (805–851)**                    | 0.655 (0.644–0.667)** | 0.660 (0.648–0.671)** |
| 20–29 (REF)         | 6229          | 1035 (1007–1062)          | 1038 (1010–1065)            | 0.713 (0.701–0.724) | 0.716 (0.705–0.727) |
| 30–49               | 11,849        | 991 (971–1010)**                                | 992 (973–1011)**                    | 0.680 (0.673–0.687) | 0.685 (0.678–0.692)** |
| 50–69               | 10,587        | 890 (873–910)**                                | 890 (870–900)**                    | 0.678 (0.670–0.686)** | 0.682 (0.674–0.690)** |
| 70+                 | 6076          | 807 (792–823)**                                | 804 (789–819)**                    | 0.713 (0.705–0.721)** | 0.720 (0.711–0.728)** |

** p < 0.01, ** p ≥ 0.05, bold = more than 5% different than the reference group. Adjusted values are age and sex standardized to the 2000 Standard US Census population. NH = Non-Hispanic.

Table S7. Estimated Total Dietary Calcium Intake from Foods and Beverages (mg/day) by USDA Food Groups in NHANES WWEIA 2001–2014 in adults 20 years of age or older.

| Food Group           | All | Male | Female | NH White | NH Black | Mexican American | Other | 20–29 | 30–49 | 50–69 | 70+ |
|----------------------|-----|------|--------|----------|----------|------------------|-------|-------|-------|-------|-----|
|                      |     |      |        |          |          |                  |       |       |       |       |     |
| Milk & Milk Products | 364 (38.5%) | 406 | 325 | 405 | 223 | 314 | 288 | 365 | 373 | 347 | 348 |
| Meat, Poultry, Fish & Mixtures | 73 (7.7%) | 89 | 59 | 72 | 87 | 67 | 71 | 86 | 79 | 67 | 51 |
| Eggs                 | 21 (2.2%)  | 25 | 16 | 20 | 23 | 28 | 18 | 21 | 22 | 21 | 15 |
| Legumes, Nuts and Seeds | 21 (2.2%)  | 24 | 18 | 21 | 15 | 26 | 24 | 21 | 22 | 21 | 19 |
| Grain Products       | 270 (28.5%) | 316 | 228 | 276 | 228 | 328 | 231 | 321 | 288 | 239 | 212 |
| Fruits               | 38 (4.0%)  | 40 | 36 | 34 | 45 | 47 | 45 | 40 | 35 | 37 | 43 |
| Vegetables           | 53 (5.6%)  | 54 | 52 | 56 | 51 | 40 | 48 | 46 | 52 | 58 | 55 |
| Fats, Oils & Salad Dressings | 3 (0.3%) | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 |
| Sugar, Sweeteners & Beverages | 103 (10.9%) | 110 | 97 | 102 | 101 | 115 | 107 | 112 | 117 | 97 | 62 |
| All Sources          | 946 | 1066 | 835 | 989 | 776 | 967 | 834 | 1035 | 991 | 890 | 807 |

NH = Non-Hispanic.

Table S8. Estimated Dietary Calcium to Phosphorus ratio (mg calcium per mg phosphorus intake from foods and beverages) by USDA Food Groups in NHANES WWEIA 2001–2014 in adults 20 years of age or older.

| Food Group           | All | Male | Female | NH White | NH Black | Mexican American | Other | 20–29 | 30–49 | 50–69 | 70+ |
|----------------------|-----|------|--------|----------|----------|------------------|-------|-------|-------|-------|-----|
|                      |     |      |        |          |          |                  |       |       |       |       |     |
| Milk & Milk Products | 1.259 | 1.268 | 1.248 | 1.252 | 1.279 | 1.282 | 1.287 | 1.282 | 1.259 | 1.248 | 1.242 |
| Meat, Poultry, Fish & Mixtures | 0.212 | 0.208 | 0.218 | 0.214 | 0.217 | 0.199 | 0.201 | 0.234 | 0.213 | 0.201 | 0.195 |
| Eggs                 | 0.435 | 0.433 | 0.438 | 0.443 | 0.452 | 0.400 | 0.402 | 0.464 | 0.443 | 0.422 | 0.392 |
| Legumes, Nuts and Seeds | 0.322 | 0.316 | 0.330 | 0.321 | 0.291 | 0.322 | 0.356 | 0.373 | 0.314 | 0.302 | 0.342 |
| Grain Products       | 0.672 | 0.678 | 0.665 | 0.692 | 0.669 | 0.619 | 0.597 | 0.704 | 0.688 | 0.655 | 0.669 |
| Vegetables           | 1.338 | 1.331 | 1.345 | 1.262 | 1.624 | 1.470 | 1.389 | 1.332 | 1.265 | 1.247 |
| Fats, Oils & Salad Dressings | 0.579 | 0.542 | 0.621 | 0.576 | 0.601 | 0.562 | 0.596 | 0.532 | 0.563 | 0.611 | 0.622 |
| Sugar, Sweeteners & Beverages | 1.051 | 0.905 | 1.265 | 0.966 | 1.331 | 1.191 | 1.380 | 1.042 | 1.007 | 1.096 | 1.205 |
| All Sources          | 0.669 | 0.665 | 0.721 | 0.705 | 0.640 | 0.660 | 0.655 | 0.713 | 0.680 | 0.678 | 0.713 |

NH = Non-Hispanic.
Figure S1. Estimated Total Dietary Energy Intake contributed by the top 3 USDA food groups. Error bars represent the 95% confidence interval.

Figure S2. Estimated Total Dietary Energy Intake contributed by the bottom 6 USDA food groups. Error bars represent the 95% confidence interval.

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