Selection of Representative Multivitamin Products Based on % Daily Value Levels for Specific Nutrients

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Abstract

A process for identifying representative multivitamin products based on specific ingredient levels has been developed using the dietary supplement files from the National Health and Nutrition Evaluation Survey (NHANES) 1999-2000 data set. Six high priority (Tier 1) nutrients (folic acid, vitamins C, A and E, calcium and iron) were evaluated. The nutrient levels in all multivitamins (containing 3 or more vitamins) that contained at least one of the Tier 1 nutrients were converted to their % Daily Value (% DV), which are the recommended daily amounts based on a 2000 calorie diet. For each of the six nutrients, a distribution of %DV levels vs. weighted frequency of use showed 3-4 major % DV levels in the products. The 3 top % DV levels for folic acid were 75%, 100%, and 250%. For Vitamins A, E and C, the range for the most frequently used % DV was 50-400%. The most common % DV levels for iron in multivitamins were 100%, 50%, and 150%. In contrast, for calcium containing multivitamins, the most common calcium level consisted of 16% DV, with 20% DV and 10% DV being the next most common. Five products representing each of these % DV levels were chosen for analysis in order to test for any systematic relationship between label values and actual values. This project was funded by ODS/NIH Y4-HV-0051-05.

Objectives

- To determine the most commonly consumed % DV levels in multivitamin and mineral dietary supplements for the six Tier 1 nutrients
- To identify representative dietary supplements per nutrient based on individual nutrient levels

Introduction

As part of the Dietary Supplement Ingredient Database (DSID) working group, the Nutrient Data Laboratory at the United States Department of Agriculture is working with the Office of Dietary Supplements at the National Institutes of Health, and the National Center for Health Statistics, Center for Disease Control to develop a validated database for dietary supplements. This database, the DSID, will report the results of a systematic survey of dietary supplement composition, including chemical analyses of the individual ingredients in supplements and indicators of data quality. In the early stages of this project, nutrient label values and information about the frequency of use of specific dietary supplements were obtained from the NHANES 1999-2000 dietary supplement questionnaire (1). The DSID working group prioritized supplement nutrients using a series of weighted factors, including exposure, research interest, measurement capabilities and public health importance (2). Six high priority (Tier 1) nutrients (folic acid, vitamins A, C, E and iron, calcium) were identified for initial pilot study work. Multivitamins, the most frequently reported dietary supplement (30% of the adult population taking supplements), were also chosen for initial study. Standard sample handling procedures and analytical methods are being developed for each nutrient. This study evaluated the most commonly consumed % DV levels in multivitamin supplements for these six nutrients, based on NHANES data. At each major % DV level for each nutrient, at least 5 products will be statistically chosen for analysis.

Methods and Materials

NHANES 1999-2000 dietary supplement questionnaire data files were imported into MS Access. In the NHANES data file, each product reported is linked to an individual survey respondent who statistically represents a portion of the population. Linking the frequency of the reporting of a product with the population estimates for each respondent provides a weighted frequency, which is the best estimate of the frequency of use nationally. Multivitamins, containing 3 or more vitamins, were evaluated for this study. For every nutrient, the nutrient component names in NHANES files were converted to one uniform name. For example, calcium carbonate, calcium citrate and other calcium ingredients were all converted to calcium. Nutrient units were first converted to common units, and then further converted to % DV. Structured Query Language (SQL) queries searched % DV levels, provided dietary supplement products and summed their weighted frequency of use at each %DV levels. Then, for every nutrient, the total weighted frequency of use was calculated. The weighted frequency at the specific %DV levels was converted to the percentage of the total weighted frequency.

Results and Discussion

A distribution of % DV levels vs. weighted frequency of use showed 3-4 major % DV levels in the products. For Vitamins A, E and C, the range for the most frequently reported levels of % DV was 50-400%. The 3 top %DV levels for folic acid, in rank order, were: 100%, 75%, and 250% DV. The most common % DV levels for iron in multivitamins were, in order, 100%, 150%, and 50%. In contrast, for calcium-containing multivitamins, the most common calcium level was 16% DV, with 20% DV being the next most common, followed by 10% DV.

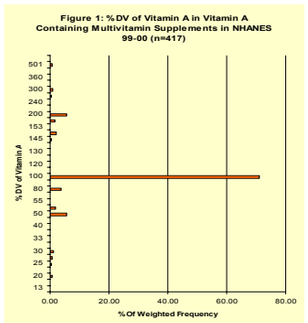

Figure 1 shows that for vitamin A containing multivitamin supplements, approximately 72% of the population (weighted frequency) reported taking a product with a labeled iron level of 100% DV.

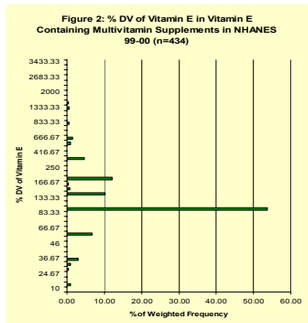

Figure 2 shows that for vitamin E containing multivitamin supplements, approximately 54% of the population (weighted frequency) reported taking a product with a level of 100% DV.

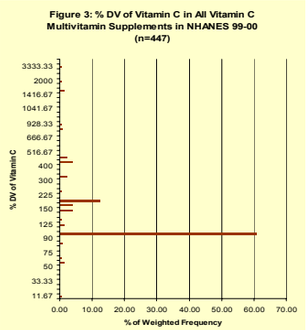

Figure 3 shows that for vitamin C containing multivitamin supplements, approximately 61% of the population (weighted frequency) reported taking a product with a labeled iron level of 100% DV

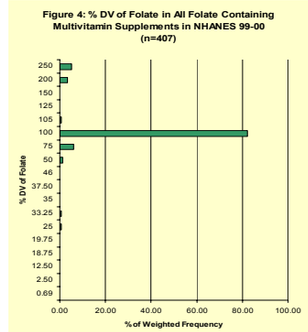

Figure 4 shows that for folate containing multivitamin supplements, approximately 80% of the population (weighted frequency) reported taking a product with a labeled folate level of 100% DV.

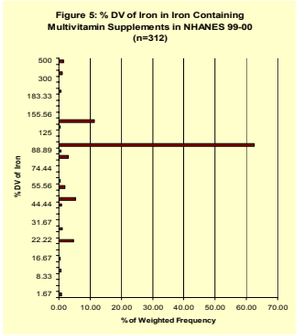

Figure 5 shows that for the iron-containing multivitamin supplements, approximately 63% of the population (weighted frequency) reported taking a product with a labeled iron level of 100% DV.

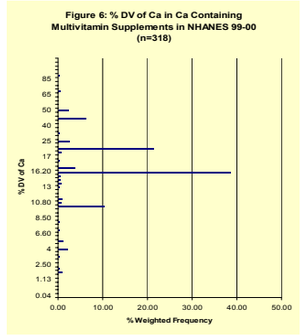

Figure 6 shows that for the calcium-containing supplements, approximately 39% of the population (weighted frequency) took a labeled calcium level of 16% DV. Twenty-one percent, 11% and 6% of the population (weighted frequency) reported taking labeled calcium levels of 20%, 10% and 45% of DV respectively.

As the graphs indicate, although there are dozens of levels of specific nutrients in reported multivitamin products, there are usually 3-4 that are most commonly found. Choosing products from these levels for analysis and getting estimates of variability for the most common levels may allow extrapolation of results to the less common levels found in other products. These and other pilot studies will answer basic questions about the sampling process, and will lay the groundwork for the full scale analytical survey of multivitamin products.

Future Plans

1. Five or more representative multivitamin/mineral products will be analyzed to estimate the mean composition of critical nutrients and to determine the variability between different products labeled at the same levels.
2. Analytically determined values will then be compared to the labeled values. This information will support the exploration of the relationship between label declaration values and actual analytical data.

References

1. http://www.cdc.gov/nchs/nhanes/ Accessed May 2004

2. Johanna T. Dwyer, Mary Frances Picciano, Joseph M. Betz, et. al. Progress in Development of an Integrated Dietary Supplement Ingredient Database at the NIH Office of Dietary Supplements. Journal of Food Composition Analysis (in press)