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| **Fruits and Vegetables Intake** |
| **Protocol Id** | 050701 |
| **Version #** | 1 |
| **Description of Protocol** | These questions from the Five-Factor Screener may be useful to assess an individual’s approximate intake of several foods. These particular questions address fruit and vegetable intake. No portion-size questions are asked. This screener does not attempt to assess total diet. |
| **Specific Instructions** | None |
| **Protocol Text** | These questions are about the different kinds of foods you ate or drank during the PAST MONTH, that is, the past 30 days. When answering, please include meals and snacks eaten at home, at work or school, in restaurants, and anyplace else.\*Read text if the respondent needs further clarification about the information requested.1. During the past month, how often did you drink 100% FRUIT JUICE, such as orange, mango, apple, and grape juices? Do NOT count fruit drinks.\*Read if necessary: INCLUDE only 100% pure juices. Do NOT include fruit drinks with added sugar, like Kool-Aid®, Hi-C®, lemonade, cranberry cocktail, Gatorade®, Tampico®, and Sunny Delight®.**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know2. During the past month . . . How often did you eat FRUIT? COUNT fresh, frozen, or canned fruit. Do NOT count juices.\*Read if necessary: Include fruits such as apples, bananas, applesauce, melon, berries, fruit salad, mangos, papayas, oranges, and grapes.**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know3. During the past month, how often did you eat a green leafy or lettuce SALAD, with or without other vegetables?\*Read if necessary: INCLUDE spinach salads**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know4. During the past month . . . How often did you eat FRENCH FRIES, home fries, or hash brown potatoes?**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know5. During the past month . . . How often did you eat other WHITE POTATOES? COUNT baked potatoes, boiled potatoes, mashed potatoes and potato salad.\*Read if necessary: Do NOT include yams or sweet potatoes. INCLUDE red-skinned and Yukon Gold potatoes.**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know6. During the past month . . . How often did you eat COOKED DRIED BEANS, such as refried beans, baked beans, bean soup, and pork and beans? Do NOT include green beans.**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know7. During the past month . . . Not counting what you just told me about (lettuce salads, white potatoes, cooked dried beans), and not counting rice, how often did you eat OTHER VEGETABLES?\*Read if necessary: Examples of other vegetables include tomatoes, string beans, carrots, corn, sweet potatoes, cabbage, bean sprouts, collard greens, and broccoli.**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know8. During the past month . . . How often did you have TOMATO SAUCES such as spaghetti sauce or pizza with tomato sauce?**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know9. During the past month . . . How often did you have SALSA?**00**[ ]Never**01**[ ]1-3 times last month**02**[ ]1-2 times per week**03**[ ]3-4 times per week**04**[ ]5-6 times per week**05**[ ]1 time per day**06**[ ]2 times per day**07**[ ]3 times per day**08**[ ]4 times per day**09**[ ]5 or more times per day**97**[ ]Refused**99**[ ]Don’t know**Scoring Procedures**For fruits and vegetables, a Pyramid serving was defined by the U.S. Department of Agriculture (USDA) in the 1992 Dietary Guidelines Food Guide Pyramid as:Vegetables: 1 cup raw leafy, 1/2 cup of other vegetables, or 3/4 cup vegetable juice; andFruits: 1 whole fruit, 1/2 cup of cut-up fruit, or 3/4 cup fruit juice.More recently, the 2005 Dietary Guidelines measure fruits and vegetables in cup equivalents. See USDA http://www.mypyramid.gov/ for definitions of cup equivalents. Scoring using both metrics is provided.The following procedures are used to convert an individual’s responses to an estimate of that individual’s daily intake of servings of fruits and vegetables.1. The frequency reported categorically on the questionnaire is converted to the number of times consumed per day, as shown below. In general, the midpoint of the frequency range was used.

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| **Table 1. Conversion of Frequency Response to Times per Day** |
| **Frequency Response** | **Times per Day** |
| Never | 0 |
| 1-3 times per month | 0.067 |
| 1-2 times per week | 0.214 |
| 3-4 times per week | 0.5 |
| 5-6 times per week | 0.786 |
| 1 time per day | 1 |
| 2 times per day | 2 |
| 3 times per day | 3 |
| 4 times per day | 4 |
| 5 or more times per day | 5 |

2. The age- and gender-specific portion sizes (below) for each food are multiplied by the frequency calculated in Step 1.

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| **Table 2a.** Median Portion Size (Pk) in Pyramid Servings\* per Mention by Gender and Age for Fruits and Vegetables |
| **Food Group** | **Age Group** |
| **18-27** | **28-37** | **38-47** | **48-57** | **58-67** | **68-77** | **78-99** |
| **Men** |
| 100% fruit juice (P1) | 2.000000 | 1.667500 | 1.335000 | 1.335000 | 1.334000 | 1.001000 | 1.001000 |
| Fruit (P2) | 1.301000 | 1.301000 | 1.229571 | 1.227333 | 1.168000 | 1.168000 | 1.052333 |
| Salad (P3) | 0.545000 | 0.708000 | 0.754500 | 0.750000 | 0.833500 | 0.750000 | 0.822500 |
| Fried potatoes (P4) | 2.000000 | 2.000000 | 1.773000 | 1.710000 | 1.400000 | 1.250000 | 1.250000 |
| Other potatoes (P5) | 2.000000 | 2.000000 | 1.999000 | 1.999000 | 1.914000 | 1.544000 | 1.508000 |
| Dried beans (P6) | 1.374000 | 1.047000 | 1.065000 | 1.227000 | 1.000000 | 1.000000 | 1.114000 |
| Other Vegetables (P7) | 0.750000 | 0.906000 | 0.974500 | 1.000000 | 1.000000 | 0.880000 | 0.833333 |
| Tomato sauce (P8) | 0.500000 | 0.541000 | 0.541000 | 0.812000 | 0.541000 | 0.541000 | 0.541000 |
| Salsa (P9) | 0.533000 | 0.533000 | 0.421500 | 0.386500 | 0.137000 | 0.266000 | 0.266000 |
| **Women** |
| 100% fruit juice (P1) | 1.500500 | 1.334000 | 1.334000 | 1.251250 | 1.019500 | 1.000500 | 1.000500 |
| Fruit (P2) | 1.168000 | 1.168000 | 1.168000 | 1.168000 | 1.150500 | 1.083833 | 1.000000 |
| Salad (P3) | 0.613500 | 0.572500 | 0.833333 | 1.000000 | 0.795500 | 0.625000 | 0.750000 |
| Fried potatoes (P4) | 1.481000 | 1.365500 | 1.272000 | 1.400000 | 1.000000 | 1.026000 | 1.000000 |
| Other white potatoes (P5) | 1.544000 | 1.544000 | 1.528000 | 1.544000 | 1.499000 | 1.516000 | 1.272000 |
| Dried beans (P6) | 0.964000 | 0.684000 | 0.800000 | 0.687000 | 0.822000 | 0.807000 | 1.000000 |
| Other Vegetables (P7) | 0.702200 | 0.779333 | 0.792500 | 0.788500 | 0.774000 | 0.833000 | 0.856750 |
| Tomato sauce (P8) | 0.541000 | 0.541000 | 0.273000 | 0.541000 | 0.500000 | 0.500000 | 0.500000 |
| Salsa (P9) | 0.274000 | 0.266000 | 0.322500 | 0.238250 | 0.266000 | 0.137000 | 0.137000 |

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| **Table 2b.** Median Portion Size (Pk) in Cup Servings\*\* per Mention by Gender and Age for Fruits and Vegetables |
| **Food Group** | **Age Group** |
| **18-27** | **28-37** | **38-47** | **48-57** | **58-67** | **68-77** | **78-99** |
| **Men** |
| 100% fruit juice (P1) | 1.499160 | 1.250580 | 1.000980 | 1.000980 | 1.000176 | 0.750735 | 0.750735 |
| Fruit (P2) | 0.999580 | 0.933450 | 0.867300 | 0.867300 | 0.867300 | 0.774916 | 0.657060 |
| Salad (P3) | 0.272700 | 0.353970 | 0.377235 | 0.374963 | 0.416640 | 0.375000 | 0.411323 |
| Fried potatoes (P4) | 0.721125 | 0.727700 | 0.641000 | 0.641000 | 0.548055 | 0.480750 | 0.499980 |
| Other potatoes (P5) | 1.000400 | 1.140030 | 0.999600 | 0.999600 | 0.999490 | 0.833175 | 0.754400 |
| Dried beans (P6) | 0.717550 | 0.551540 | 0.566720 | 0.612360 | 0.500250 | 0.502285 | 0.575360 |
| Other Vegetables (P7) | 0.387675 | 0.473920 | 0.499840 | 0.500240 | 0.499905 | 0.460585 | 0.416899 |
| Tomato sauce (P8) | 0.249900 | 0.271250 | 0.271250 | 0.406875 | 0.271250 | 0.271250 | 0.271250 |
| Salsa (P9) | 0.266430 | 0.266430 | 0.210897 | 0.195683 | 0.068480 | 0.133236 | 0.133236 |
| **Women** |
| 100% fruit juice (P1) | 1.124370 | 1.000960 | 1.000176 | 0.938130 | 0.764776 | 0.750728 | 0.750434 |
| Fruit (P2) | 0.749235 | 0.867300 | 0.844838 | 0.789970 | 0.742350 | 0.712640 | 0.620475 |
| Salad (P3) | 0.306788 | 0.286335 | 0.416625 | 0.499950 | 0.397688 | 0.312469 | 0.374963 |
| Fried potatoes (P4) | 0.509595 | 0.455110 | 0.448700 | 0.448700 | 0.394856 | 0.444260 | 0.444260 |
| Other white potatoes (P5) | 0.782020 | 0.876945 | 0.771260 | 0.771260 | 0.749700 | 0.771260 | 0.644235 |
| Dried beans (P6) | 0.492150 | 0.341550 | 0.430530 | 0.345763 | 0.430685 | 0.430530 | 0.500400 |
| Other Vegetables (P7) | 0.364468 | 0.395882 | 0.404303 | 0.408330 | 0.416913 | 0.436560 | 0.452214 |
| Tomato sauce (P8) | 0.271250 | 0.271250 | 0.136710 | 0.271250 | 0.249900 | 0.249900 | 0.249900 |
| Salsa (P9) | 0.136960 | 0.133236 | 0.163080 | 0.119187 | 0.133236 | 0.068480 | 0.068480 |
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3. For Pyramid servings of fruits and vegetables, including and excluding French fries, for each gender, the estimated regression coefficients are:

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| **Table 3a.** Estimated Regression Coefficients for Sum of Foods Predicting Servings of Total Fruits and Vegetables and Fruits and Vegetables Excluding French Fries, by Gender |
| **Parameter** | **Men** | **Women** |
| **Summary Variable with French fries** |
| Intercept (b0) | 0.704319 | 0.658819 |
| b1 | 0.835532 | 0.796243 |
| **Summary Variable excluding French fries** |
| Intercept (b0) | 0.729653 | 0.639540 |
| b1 | 0.822694 | 0.804796 |

For cups of fruits and vegetables (2005 MyPyramid definition), including and excluding French fries, for each gender, the estimated regression coefficients are:

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| **Table 3b.** Estimated Regression Coefficients for Sum of Foods Predicting Cups of Total Fruits and Vegetables and Fruits and Vegetables Excluding French Fries, by Gender |
| **Parameter** | **Men** | **Women** |
| **Summary Variable with French fries** |
| Intercept (b0) | 0.529258 | 0.502480 |
| b1 | 0.839721 | 0.792683 |
| **Summary Variable excluding French fries** |
| Intercept (b0) | 0.559458 | 0.495205 |
| b1 | 0.819797 | 0.794978 |

For both metrics, these regression coefficients are applied according to the equation below.E (Fruits and Veg1/2) = b0 + b1 (NFG1P1 + NFG2P2 + ... + NFG9P9)1/2For men:Cube root of daily cup equivalents of fruits and vegetables = 0.529258 + 0.839721 (cube root of (Daily Frequency \* Gender/Age Specific Portion Size per Mention for 100% fruit juice + Daily Frequency \* Gender/Age Specific Portion Size per Mention for Fruit + ... + Daily Frequency \* Gender/Age Specific Portion Size per Mention for salsa))For women:Cube root of daily cup equivalents of fruits and vegetables = 0.502480 + 0.792683 (cube root of (Daily Frequency \* Gender/Age Specific Portion Size per Mention for 100% fruit juice + Daily Frequency \* Gender/Age Specific Portion Size per Mention for Fruit + ... + Daily Frequency \* Gender/Age Specific Portion Size per Mention for salsa))\*Using 1992 Food Guide Pyramid definitions of servings.\*\*Using 2005 MyPyramid definitions of cups of fruits and vegetables.Kool-Aid® is a registered trademark, Kraft Foods Inc.; Hi-C® is a registered trademark, The Coca-Cola Company; Gatorade® is a registered trademark, PepsiCo Inc.; Tampico® is a registered trademark, Tampico Beverages, Inc.; Sunny Delight® is a registered trademark, Sunny Delight Beverages Co. |
| **Selection Rationale** | Vetted against several other fruit and vegetable questionnaires, these questions from the National Cancer Institute (NCI) Five-Factor Screener were selected because they are low burden and have been validated against the 24-hour dietary recall. |
| **Source** | Centers for Disease Control and Prevention, National Center for Health Statistics. National Health Interview Survey (NHIS) 2005. Diet and Nutrition Questionnaire, questions: NAC.040\_00.00 (question 1), NAC.070\_00.00 (question 2), NAC.090\_00.00 (question 3), NAC.100\_00.00 (question 4), NAC.110\_00.00 (question 5), NAC.120\_00.00 (question 6), NAC.130\_00.00 (question 7), NAC.131\_00.00 (question 8), and NAC.132\_00.00 (question 9).National Cancer Institute, Five-Factor Screener 2005. National Health Interview Survey (NHIS) Diet and Nutrition. NAC.010–NAC.138. |
| **Language** | English, Spanish |
| **Participant** | An individual aged 18 years or older |
| **Personnel and Training Required** | The interviewer must be trained to conduct personal interviews with individuals from the general population. The interviewer must be trained and found to be competent (i.e., tested by an expert) at the completion of personal interviews. The interviewer should be trained to prompt respondents further if a "don’t know" response is provided.There are multiple modes to administer this question (e.g., paper-and-pencil and computer-assisted interviews). |
| **Equipment Needs** | While the source instrument was developed to be administered by computer, the PhenX Working Group acknowledges these questions can be administered in a noncomputerized format (i.e., paper-and-pencil instrument). Computer software is necessary to develop computer-assisted instruments. The interviewer will require a laptop computer/handheld computer to administer a computer-assisted questionnaire. |
| **Standards** |

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| **Standard** | **Name** | **ID** | **Source** |
| Common Data Elements (CDE) | Person Fruit or Vegetable Intake Number | 2947000 | [CDE Browser](https://cdebrowser.nci.nih.gov/CDEBrowser/search?elementDetails=9&FirstTimer=0&PageId=ElementDetailsGroup&publicId=2947000&version=1.0) |
| Logical Observation Identifiers Names and Codes (LOINC) | PhenX - fruits and veg protocol | 62284-5 | [LOINC](http://s.details.loinc.org/LOINC/62284-5.html?sections=Web) |

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| **General References** | Five-Factor Screener: [Validation Results](http://www.phenxtoolkit.org/index.php?pageLink=browse.si.additionalinfo&id=50000) |
| **Protocol Type** | Interviewer-administered questionnaire |
| **Derived Variables** | None |
| **Requirements** |

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| **Requirement Category** | **Required** |
| Average time of greater than 15 minutes in an unaffected individualAverage time of greater than 15 minutes in an unaffected individual | No |
| Major equipmentThis measure requires a specialized measurement device that may not be readily available in every setting where genome wide association studies are being conducted. Examples of specialized equipment are DEXA, Echocardiography, and Spirometry | No |
| Specialized requirements for biospecimen collectionThis protocol requires that blood, urine, etc. be collected from the study participants. | No |
| Specialized trainingThis measure requires staff training in the protocol methodology and/or in the conduct of the data analysis. | No |

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