Estimating Total Dietary Intakes

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28th National Nutrient Databank Conference
Iowa City, June 2004
Outline

• Intake distributions
• Measuring daily nutrient intake
  – Intake from food and supplements
• Usual total nutrient intake distribution
• Challenges and opportunities
Estimating usual intake distributions is important…

• Assessment of group intakes using DRIs.
• Monitoring nutritional status of groups.
• Planning food intake for groups, including intervention and fortification programs.
• Design and evaluate food assistance programs, public health programs, other.
...But it is also challenging

- Intake data present challenges for analyses
- Lots of "noise": measurement, day-to-day variability in intakes, other effects on intake
- Large samples, but scarce information on each sample person.
- Data not well "behaved" from statistical viewpoint.
- Additional difficulties associated to infrequently consumed items and supplements.
Daily intake of a nutrient

• Can be “measured” using 24-hour recalls, food diaries, other instruments

• Is subject to measurement error: under-reporting, portion sizes, food composition database (“promiscuous fortification”, Beaton)

• Varies from day to day within an individual, and also between individuals
Usual nutrient intake

- The “habitual” or long-run average intake of a nutrient
- Unobservable in practice
- Can be estimated as the mean of several observed daily intakes
- Varies from individual to individual
- *Distribution of usual intakes* is typically of interest
Data needed to estimate usual nutrient intake distributions

• *Daily* observations of nutrient intake on representative sample of individuals

• An independent *replicate* observation on at least a representative sub-sample of individuals

• Replicate permits adjusting away within-individual variability in intakes.
An important use of usual nutrient intake distributions

- Assess *prevalence of inadequate* intakes in a group.
- Usual intake is inadequate if it does not meet individual’s requirement.
- Prevalence of inadequacy in a group is the proportion of individuals with *usual* intakes below the EAR (EAR cut-point method).
Example: Vitamin B₆ in Women 19-50 yrs

\[ \text{EAR} = 1.1 \]
Another important use of usual intake distributions

• Risk of adverse effects may increase for intake levels above the UL
• Proportion of individuals at potential risk equals proportion with usual intakes above the UL
Total nutrient intake

• Total nutrient intake = nutrient intake from food and from supplement sources

• Important to evaluate total nutrient intake:
  – For some nutrients, portion of intake from supplements may be large
  – Adequacy and excess perhaps underestimated if only food sources are considered
  – Some UL’s defined only for supplement-derived nutrient intake (e.g., Mg)
Total nutrient intake (cont’d)

• 33% of Caucasian women 19-50 yrs consume supplements. Hispanic and African American women: 18%, 23% (NHANES III).
• 36% of all respondents in NHANES 1999-2000 report consumption of at least one supplement.
• Two thirds of consumers take daily supplements.
• Group mean intake increases when considering total intake.
• Prevalence of inadequacy less affected.
• Effect on upper distribution tail striking.
Ex: Vitamin C, non-smoking women 19-30 yrs, NHANES III
### Food only vs. food + supplements

**Vit C, women 19-30, smoking**

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<td>141</td>
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<td>Total</td>
<td>121</td>
<td>30</td>
<td>193</td>
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**Vit C, women 19-30, non-smoking**

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</thead>
<tbody>
<tr>
<td>Food</td>
<td>102</td>
<td>63</td>
<td>148</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>139</td>
<td>65</td>
<td>205</td>
<td>7%</td>
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Distribution of usual total nutrient intake

• Ideally, add daily food and supplement nutrient intake and then adjust.
• Resulting distribution is total usual intake distribution in group.
• Day-to-day variability in supplement intake should be investigated.
Questions:

• Are supplements like frequently consumed items?
  – Recent NHANES data suggest that most supplement users may consume daily or weekly
  – Two 24-hr recalls might capture consumption of daily and weekly users

• What about occasional and non-consumers?
  – Need an FFQ-type question to ask about frequency of supplement consumption
Total nutrient intake (cont’d)

• What data are needed?
  – Replicate 24-hr recalls to capture daily supplement intake
  – A *propensity* question to augment the 24-hr recalls and identify occasional consumers.
• 24-hr recalls not enough to capture the “sometimes” consumer of supplements.
• Standard methods for estimating usual intake distributions would apply to “corrected” 24-hr recalls.
Challenges and opportunities

• Supplements an important nutrient source.
• Accounting for supplements in dietary assessment is a challenge:
  – Myriad different formulations.
  – Rapidly changing market.
  – Only partially understood consumption patterns.
Challenges and opportunities (cont)

- Daily, almost daily, weekly consumption pattern: no major difficulties from survey and statistical analysis viewpoint.
- Non-consumers cause no difficulty.
- Occasional consumers not easily captured with two 24-hr recalls.
- Propensity question to help “calibrate” data.
Challenges and opportunities (cont)

• Supplements and infrequently consumed items are different beasts:
  – Supplements add to food nutrient intake.
  – Infrequently consumed items (e.g., spinach, lycopene) are either consumed or not.

• For estimation of usual intake distributions, including nutrient intake from supplements is challenge similar to analyzing vitamin A.
Thanks for listening!

- **Background literature:**
  
  *Dietary Reference Intakes: Applications in Dietary Assessment*, IOM, 2000

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