Harmonizing Nutrient Intake Values: Phase 1

Janet C. King, Ph.D.
Senior Scientist, Children’s Hospital Oakland Research Institute, and
Professor Emerita, University of California at Berkeley
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Charge: To review harmonizing approaches for developing nutrient-based dietary standards.

17 International Nutrition Scientists:
King, JC and Garza, C (Chairs)
P Aggett, L Allen, S Atkinson, R Gibson, B Koletzko, S Murphy, P Pietinen, S Smitasiri, S Ramaswamy, P Shetty, P Stover, D Tome, R Uauy, B Viswanathan, H Vorster, A Yates
Why Harmonize the Process for Developing Nutrient Intake Values (NIVs)

- To improve objectivity and transparency of values developed by different groups
- To provide a common basis for various NIVs
- To allow LICs, with limited resources, to convene groups for modifying the standards for their specific food supplies or national policies
- To provide a common basis across countries and regions for establishing global policies, i.e., fortification programs, regulatory issues
Terms to Harmonize

• Nutrient Intake Values (NIVs):
  – Term referring to the set of recommendations
  – Analogous to those values developed by different regions (i.e., DRIs, DRV, NRVs)

• Two NIVs established:
  – Average nutrient requirement (ANR)
  – Upper nutrient level (UNL)

• Other nutrient values, e.g. LRNI (lower reference nutrient intake), RDA (recommended dietary allowance), may be derived from these values

• Safe intakes or adequate intakes (Ais) may be established when data are insufficient for an ANR.
Framework for Estimating Average Intake Values (ANRs)

- ANRs are based on the mean intakes; if not distributed normally, data should be normalized and the median value used.
- ANRs should be established for all essential nutrients and food components that have public health relevance.
- Acceptable macronutrient distribution (i.e., carbohydrate, protein, and fat) ranges may be established for reducing chronic disease risk (ANRs are also set for protein).
- Nutrient-nutrient interactions (i.e., protein-energy, vitamin E-PUSFAs) should be characterized quantitatively, if possible.
- Subpopulations with special needs (i.e., smokers) should be considered separately. ANRs are for “apparently healthy” individuals.
Framework for Estimating Upper Nutrient Levels (UNLs)

- **UNL**: the highest level of a habitual nutrient intake that poses no risk of adverse health effects in almost all individuals in the general population.

- UNLs can be determined by applying an uncertainty factor to NOAEL or LOAEL. Magnitude of uncertainty factors need to be considered on a case-by-case basis.

- Suggested that the uncertainty factor be estimated from a list of potential effects of excessive intakes.

- Need biomarkers that *anticipate* adverse effects.

- Dose-response data for determining UNLs is limited, especially among pregnant and lactating women, children, and the elderly.
Criteria for Selecting NIVs Indicators

• A dose-response function is demonstrated
• Responsive to inadequate or excessive intakes of a single nutrient
• Resistant to rapid (daily) changes in response to inadequate, adequate, or excessive intakes
• Easily measured or assessable with noninvasive methods
• Not responsive to environmental changes other than nutrient intake from all sources

Recommendations:
• Use a single outcome for each nutrient/age group
• NIV will vary with the population & outcome; need to fully describe the basis of the NIV
Bioequivalence: Bioavailability or Bioefficiency

- **Bioavailability**: proportion of the ingested nutrient absorbed and utilized through normal metabolic pathways. Bioavailability is influenced by dietary and host-related factors. (Ex: zinc, calcium, retinol, folate)

- **Bioefficiency**: efficiency with which ingested nutrients are absorbed and converted to an active form. (Ex: carotenoids, various tocopherols)

- **Multiple physiological and food factors influence bioequivalence.**
  - Enhancers or inhibitors of absorption
  - Efficiency of metabolic conversion
  - Food processing, treatment, or preparation

- **Factors to consider**: Infection, nutrient-nutrient interactions
Life-Stage Factors: Issues to Address

• How to set life-stage groups: by age, function (i.e., growth), or potential purposes (i.e., complementary feeding)
• Use the same life-stage groups for all nutrients
• Treat pregnancy & lactation as two groups
• How to set standard heights & weights:
  – WHO growth standards
  – Average weight of men & women at 18 years used throughout adult years, no increase in body weight with age
Other Considerations

• Extrapolation methods: No one “correct” method.
  – Transparency is important.
  – Examples: body size (weight/metabolic weight), energy intake, factorial estimates for growth or milk production during lactation.

• Genetic variation in NIVs: Issues to address.
  – Consider prevalence and penetrance.
  – Conclusion: Unlikely that gene-gene interactions will affect NIVs because of the low prevalence associated with highly penetrant genes.
  – Can gene variants be linked to nutrient-sensitive subgroups (i.e., salt sensitivity).
Nutrient Intake Values Framework

To Be Harmonized Globally

- Evaluate criteria
- Extrapolate if necessary
- Adjust for:
  - Food sources
  - Host factors
- Consider:
  - Genetic variation
  - Long-term health

At Country or Region Level

- Average nutrient requirement (ANR)
  Estimated from a distribution of requirements based on a specific criterion in healthy individuals

- Individual nutrient level\(_x\) (INL\(_x\))
  Derived from the distribution of the ANR; \(x=\)percentile chosen

- Upper nutrient level (UNL)
  Using a LOAEL/NOAEL with an appropriate uncertainty factor

Methods of using NIVs

- Assessment/evaluation
  - Individuals
  - Populations
- Diet Planning
  - Individuals
  - Populations

Applications

- Regulatory issues and trade
- Labeling
- Public health planning
- Fortification
- Dietary guidance
Thank you!