

Dietary Supplements: Regulatory Challenges and Research Resources

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Disclosures

- **President, American Society for Nutrition (2021-2022)**
- **Consultant, Indiana University School of Public Health (2018-present)**
- **Consultant, Purdue University, Department of Nutrition Science (2019)**
- **Member, Tufts Nutrition Council (2018-2020)**
- **Member, Nominating Committee, USP Council of Experts (2019)**
- **Issue Specialist on Dietary Supplements, Global Council on Brain Health, AARP (2018-2019)**
- **Consultant, Tilia Holdings (2020)**
- **Consultant, Mars Symboscience (2021)**

Outline

- **Dietary supplements 101**
- **Regulatory challenges**
- **Research resources – ODS as a case study**
- **Wrap up**

Dietary Supplement Health and Education Act of 1994 (DSHEA)

- **Amended the Food Drug and Cosmetic Act**
 - **Defined a dietary supplement (DS)**
 - **Assured that consumers had access to DS products**
 - **Established the regulatory framework for DS (foods, not drugs)**
 - **Established rules for what a DS label should contain**
 - **Gave the Food and Drug Administration authority to write DS-specific cGMPs**
- **Amended the Public Health Service Act**
 - **Created the Office of Dietary Supplements (ODS) at the National Institutes of Health (NIH)**

Dietary Supplements

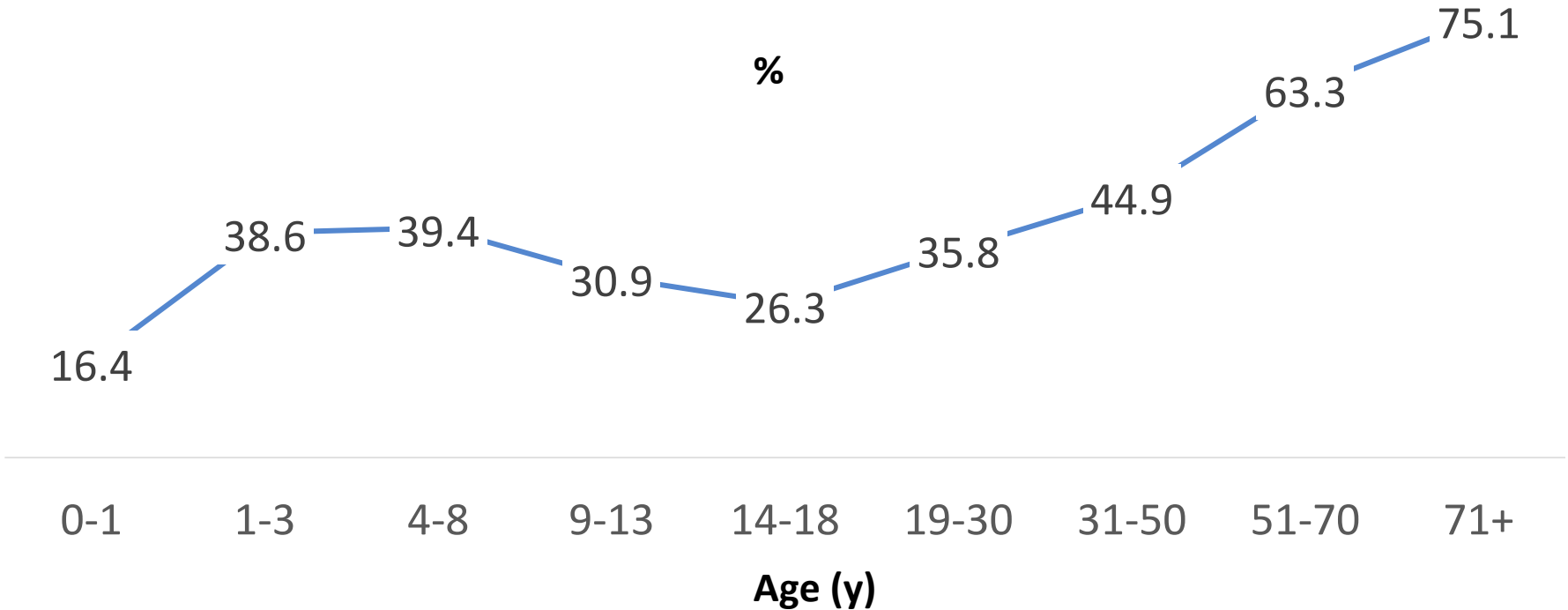
- **Products intended to be taken by mouth to supplement the diet**
- **Vitamins, minerals, amino acids, fatty acids**
- **Other bioactive components of foods (e.g., flavonoids)**
- **Herbal extracts and ingredients (e.g., turmeric, cinnamon)**
- **Botanical products that are not generally part of the diet (e.g., echinacea, ginkgo, St. John's wort)**
- **Other non-food ingredients (e.g., probiotics, prebiotics, chondroitin, melatonin)**
- **Multiple dosage forms: tablets, capsules, liquids, powders, gummies...**
- **Can be single-ingredient, multiple-ingredient, complex proprietary formulas**
- **Sales have grown from ~\$4B in 1994 to more than \$55B in 2020**

Patterns of Dietary Supplement Use

- **Most commonly consumed product is a multivitamin/multimineral (MVM), although there are wide differences in the composition of MVMs**
- **They can contribute a lot, sometimes more than 100% of the Recommended Dietary Allowance, to the intake of nutrients**
 - **If not accounted for in assessing dietary intake, can lead to underestimates of both intake and the potential for excessive exposure**
- **Widespread use by the public**
 - **More than 50% of US adults consume products on a regular basis**
 - **More than 75% of adults >71 years of age**
 - **Female>male; White>Black; SES, education, background diet all affect use**
 - **Motivations include: to supplement the diet; to provide “nutritional insurance”; to maintain health; to enhance “performance”; to prevent disease; sometimes, to treat disease**

Prevalence of Use of Any Dietary Supplement

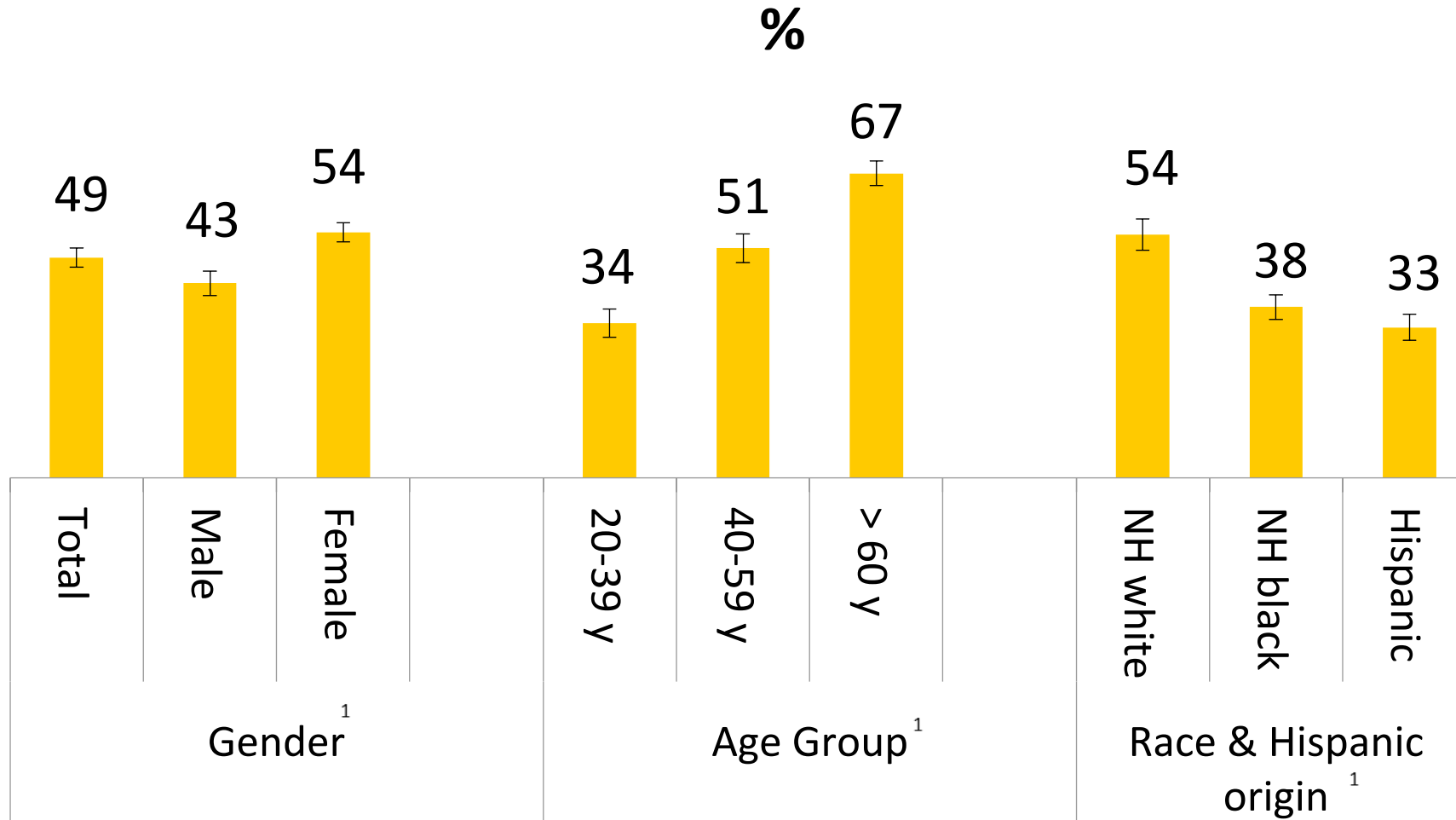
NHANES 2011-2014



SOURCES: CDC/NCHS, National Health and Nutrition Examination Survey, 2011-2014.

Dietary Supplement Use in Adults

NHANES 2007-2010



¹Statistically significant difference for all groups, $p < 0.05$
Error bars represent 95% confidence intervals.

Bailey et al., JAMA Internal Medicine

SOURCES: CDC/NCHS, National Health and Nutrition Examination Survey, 2007-2010.

Regulatory Challenges for Dietary Supplements

- **In the US, food rules – *not* drug rules – apply**
 - No pre-market approval or product registration
 - Manufacturers are required to assure that their products are safe
 - FDA can regulate products post-market
 - FTC can enforce advertising rules
- **Regulated in very different ways around the world**
 - Products can be drugs, foods, dietary supplements, biologics, natural health products...
 - Names can be invented with no regulatory meaning: nutraceuticals, phytochemicals...
 - But, common elements exist: GMPs, adverse event reporting, claims, labeling
 - And, regardless of the regulatory framework, the need for scientific evidence exists



NIH OFFICE OF DIETARY SUPPLEMENTS

Strategic Plan 2017–2021

Strengthening Knowledge &
Understanding of Dietary Supplements

DECEMBER 2016



Identifying ODS Priorities

- What is the public health issue?
- How are nutritional status and bioavailable levels of dietary supplement (DS) metabolites measured? Are the measures reliable?
- What is the evidence for health effects of DS? At what levels?
- How should ODS and the research community fill the gaps in knowledge?
- How should we translate the results of research for policymakers, clinicians, and especially the public?

Scientific Challenges

- **Widespread use based (largely) on observational data showing apparent benefit**
- **Very few interventional studies, most of which have failed to document obvious benefit or harm, with notable exceptions**
 - **Folic acid fortification, supplementation reduce the risk of neural tube defects**
 - **AREDS formula reduces progression of macular degeneration**
 - **β -carotene supplementation increases risk of cancer in tobacco users**
 - **Vitamin E supplementation may increase risk of prostate cancer**
- **Background diet, nutrient status likely affect response**
- **Variability among products**

ODS Research Resources

It's all about collaboration to build capacity and support the scientific enterprise

- **Grant co-funding with NIH Institutes and Centers**
- **Centers for Advancing Research on Botanical and Other Natural Products (CARBON) Program**
- **Analytical Methods and Reference Materials (AMRM) Program**
- **Dietary Supplement Label Database *and* Ingredient Database**
- **Nutrient Initiatives – Vitamin D, Iodine**
 - **Vitamin D Standardization Program (until 2018)**
- **Population Studies Program**
- **Workforce Development**

Analytical Methods and Reference Materials (AMRM) Program



- Development of laboratory tools (methods, reference materials) to assist in the verification of manufacturers' label claims and in quality control.
- Quality assurance programs for product contents and nutritional biomarkers (vitamin D, Ω -3 fatty acids).
- Workshops on methodologies for characterizing dietary supplements and improving laboratory performance.
- Validation of methods used in biomedical research on botanicals and other dietary supplement ingredients.
- ODS website includes a searchable database of analytical methods.
- The overall goal is to enhance the foundation for rigorous DS research and development, regulation, and quality.

Dietary Supplement Databases



- **The Dietary Supplement Label Database (DSLDB) contains data from >120,000 labels (adds 1,000 new labels/month).**
 - **Both on-market and off-market**
- **The Dietary Supplement Ingredient Database (DSID) provides analytically derived information on the amount of ingredients of some widely consumed dietary supplements (multivitamins, Ω -3 fatty acids, prenatal vitamins, green tea).**
 - **Collaboration with USDA/ARS**
- **Computer Access to Research on Dietary Supplements (CARDS) provides information on research projects pertaining to dietary supplements funded by the NIH, USDA, DoD, and other agencies since 1999.**

Workforce Development



- Funds training and career development awards through NIH extramural mechanisms.
- Sponsors ODS Intramural Scholars awards with NIH ICs.
- Collaborates with other Federal agencies to support postdoctoral fellows (e.g., NIST and USDA).
- Offers short-term training opportunities for students and faculty members at ODS.
- Hosts the annual Mary Frances Picciano Dietary Supplement Research Practicum, a 3-day intensive course on issues in dietary supplement research.

Communicating the Science of Supplements



- Media inquiries and questions from the public about dietary supplements.
- More than two dozen fact sheets on dietary supplement ingredients and on supplements marketed for specific purposes (such as weight loss, athletic performance).
- Website (<https://ods.od.nih.gov>) provides:
 - Detailed descriptions of ODS program areas and activities, including contact information for staff members.
 - Research funding opportunities, listing of funded grants.
 - **>1.0 million visitors per month to the ODS website.**
- Daily posts on Twitter, Facebook.
- E-newsletters, such as *ODS Update* (directed to professional audiences) and *The Scoop* (for consumers), as well as email blasts on special topics.

Coates CHE Presentation Nov 2021 - PowerPoint

Vivian Coates

Health Information

ods.od.nih.gov/HealthInformation/healthinformation.aspx


NIH National Institutes of Health
Office of Dietary Supplements

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Dietary Supplement Fact Sheets

Evidence-based summaries for health professionals and consumers on specific vitamins, minerals, herbs, and other dietary supplements. Fact sheets cover health effects, safety, recommended amounts, interactions with medicines, and other topics.

Have a question about dietary supplements? Ask ODS.

For Health Professionals
For easy access to up-to-date, evidence-based information that will help you discuss dietary

Dietary Supplements: What You Need to Know
Key points about dietary supplements, including

Frequently Asked Questions
Answers to common questions about the use, quality, and regulation of dietary supplements.

Top

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Concluding Remarks and Observations

- **Dietary supplements are widely used by the US population.**
- **Dietary supplements, especially botanicals, can be complex mixtures that create challenges for investigation: active ingredient(s), multiple components, dosing, efficacy, safety, reproducibility.**
- **Resources need to be expanded to deal with these issues – which also extend to the study of bioactives derived from food products.**

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