Consumers’ appetite for food and nutrition news seem nearly insatiable. That is not surprising in light of unprecedented developments in the nutrition research world. In recent years, scientific evidence has revealed that bioactive dietary components may benefit health in ways that extend beyond meeting basic nutritional needs. Some components, when consumed often enough and in sufficient amounts, may help reduce the risk for developing chronic diseases such as heart disease, cancer, diabetes, or obesity. In addition, scientists are equipped with new knowledge and technologies to better identify functional dietary components and evaluate their potential health effects, as well as understand the genetic variances in nutritional needs.

The emerging science surrounding how whole foods, food components, and dietary supplements may promote health and reduce disease risk is exciting. Yet, dietary recommendations from established scientific authorities change little over time due to the need to build a strong body of evidence before making widespread public health recommendations. This contrast presents new challenges to journalists, health professionals, and other communicators who strive to responsibly relay new findings to the public amid established dietary guidance in our time-crunch world.
Learning Objectives

- Identify key elements of a given nutrition study that are key to appropriate interpretation.
- Identify strengths and weaknesses of a nutrition study.
- Discuss consumer attitudes and preferences that impact food and nutrition communications.
- List strategies for strengthening food and nutrition communications.

After completing this self-study module, the reader will be able to:

- Identify elements of nutrition research that are relevant to appropriate interpretation.
- Identify components of a nutrition study that assist in determining strengths and weaknesses of the research.
- Discuss consumer attitudes and preferences that impact food and nutrition communications.
- List “7 Guiding Principles” for successful communication of food and nutrition research.

Watch for “Learning Guideposts” throughout the module, provided to summarize and emphasize important material.
Research into the health effects of individual dietary components is indeed creating a fountain of knowledge that flows fast enough to keep the most motivated dietitian on his or her toes. Dietetic professionals, after all, play a key role in informing and conducting nutrition research, as well as understanding and translating scientific findings into layman’s terms for the public.

This module will address the important factors to consider for effective food and nutrition science communication:

- **Interpreting science**: Translating research findings must begin with a strong understanding of the scientific process. This module will help to reinforce the scientific foundation that is provided in dietetics education, helping you to apply that knowledge to understanding the strengths and weaknesses of individual studies and potential reasons for disparate findings among studies, and to place individual studies within context of the full body of evidence. Continuing to hone these skills can enable the dietetic professional to identify connections between various fields that impact nutrition, and to identify gaps in research.

- **Making messages meaningful**: Bringing research findings to the consumer in a way that speaks to their own questions builds a bridge of understanding, and ideally action. The dietitian is uniquely positioned to build these bridges in a variety of settings, from patient counseling to community classes and initiatives, to media interviews. This module will explore quantitative data regarding consumer knowledge and attitudes toward nutrition, as well as the information environment that consumers experience day to day.

- **Guidelines for Making Research Relevant to Consumers**: Seven guiding principles will be presented that will help you to integrate appropriate interpretation with consumer understanding, thereby strengthening your communications regarding food and nutrition science.
Interpreting Science

- The scientific process
- What we learn from various types of studies
- How to read and interpret a research report
- Context of the broader body of evidence

As the foundation of effective translation of science is appropriate interpretation, we will begin with a review of this process.
The Research Question

- The question is the starting point for critical evaluation of research
- A good research question:
  - Can be answered empirically
  - Builds on current knowledge
  - Challenges assumptions
  - Is part of a process vs. a destination

A critical assessment of research cannot begin without a clear understanding of the research question. The National Research Council’s Committee on Scientific Principles for Education Research produced a report in 2002 (NRC 2002) at the request of the National Educational Research Policy and Priorities Board in order to address several questions regarding education research. Shavelson and Towne (2004) reviewed the Committee’s process and conclusions, focusing on the concept that questions drive research. They point out that a research question, quite simply, “can be answered empirically.”

Building on this concept, as well as the principles of the scientific process, a good research question:

- **Can be answered empirically.** A question should be specific and focused in order to facilitate an effective design.
- **Builds on current knowledge,** recognizing the existing body of evidence, and working to fill the identifiable gaps.
- **Challenges assumptions.** Acceptance of the answer would end the inquiry. By definition, a scientist is always looking for the next question, the angle not yet considered or fully characterized.
- **Is part of a process vs. a destination.** While the question drives the research, the research also certainly drives more questions.

Types of Research Studies: Observational

- Examines relationships between and among specific variables
  - Variables can be the characteristics of subjects and the aspects of health or illness
- Suggests relationships, does not determine cause and effect
- Cohort vs. Case-Control

Observational research investigates the relationships between specific factors in defined groups of subjects with particular aspects of health or illness. Observational research can only suggest relationships, however. It takes experimental research to determine cause and effect.

In a cohort study, subjects are selected based on the presence or absence of a variable of interest, such as smoking, diabetes, or gender. Cohort studies are generally prospective, meaning that the researchers follow up with the subjects periodically over time, measuring the emergence of other variables of interest, such as lung cancer, mortality, or weight changes.

In a case-control design, variables of interest are measured in and compared among groups of subjects, divided according to the presence or absence of a condition of interest.

To elaborate on these different approaches, an observational study may seek to evaluate relationships between cancer incidence and consumption of vegetables in female smokers. A prospective cohort trial would collect current data about vegetable intake, and follow up with the female smokers periodically over time to assess cancer incidence, and perhaps updated dietary and smoking behaviors. A case control study may consider the same variables in the same population subgroup, but would assess vegetable intake and cancer incidence at a particular point in time.

In experimental research, study subjects (whether human or animal) are selected according to relevant characteristics and are then randomly assigned to either an experimental group or a control group. Random assignment ensures that variables that may affect the outcome of the study are distributed equally among the groups and therefore could not lead to differences in the effect of a treatment. The experimental group(s) is/are then given a treatment (sometimes called an intervention), and the results are compared with those for the control group, which receives either no treatment or a placebo treatment. Any differences in results between the groups can then be attributed to the treatment; that is, the effect can be considered to be caused by the treatment. In clinical trials, the subjects and/or the researchers may be blinded as to the identity of the intervention versus control groups. Even controlled experimental studies have limitations (IFIC Foundation 2001). For this reason, peer review is in part designed to identify limitations that may not have been apparent to the researchers.

Experimental research can be divided into two basic types of inquiry: basic research and clinical trials.

**Basic research** generates data by investigating biochemical substances or biological processes. It is often undertaken to confirm observations or discover how a particular process works. For example, an experiment might take place to examine how vitamin E may help reduce the risk of LDL (low-density lipoprotein) cholesterol oxidation, a process believed to play a role in the development of heart disease. This basic research is just part of a larger effort to understand how diet can help reduce risk for heart disease.

Basic research may be conducted in vitro (such as in test tubes) or with animals. Research with animals is an important tool in determining how humans may react when exposed to particular substances. However, it is important to note that, due to differences in physiology and the fact that, in research, animals are routinely exposed to levels of compounds far higher than those that human populations typically encounter, one cannot assume that results from studies with animals can necessarily be generalized to humans.

**Clinical trials** deal with the experimental study of human subjects. “Clinical” seems to imply that it takes place in a clinical setting. However, these studies are distinguished from observational research in that they involve the measurement of variables of interest, compared to a “control,” and from other experimental research in that human subjects are directly involved. The research setting may vary among studies, and the variables of interest may be behavioral, as well as physiological.

Trials may attempt to determine whether the findings of basic research are applicable to humans or to confirm the results of epidemiological research. Studies may be small, with a limited number of participants, or they may be large intervention trials that seek to discover the outcome of treatments on entire populations.

**Gold standard** clinical trials are randomized, double-blind, placebo-controlled studies that use random assignment of subjects to experimental and control groups, blinding of both subject and researcher regarding the assignment of subjects to the respective groups, and administration of a placebo treatment to the control group in order to facilitate blinding.


Cross-Cutting Fields of Study: 
Epidemiology

- Study of distribution and determinants of health outcomes in humans
- Does not indicate cause and effect
- Most revealing when considered within context of experimental research

Epidemiological research is often observational, but it may also be experimental. It is the study of the distribution and determinants of diseases or other health outcomes in human populations. It seeks to expose potential associations between aspects of health (such as cancer and heart disease) and diet, lifestyle, habits, or other factors within populations.

Although epidemiological studies are useful for suggesting relationships between two factors, it is important to remember the basic limitation of epidemiological studies: they do not necessarily indicate cause and effect. In fact, the associations that they indicate can actually turn out to be coincidental.

Observational epidemiological research may be most revealing when considered in the context of what experimental research suggests about a subject. For example, to assess whether an association discovered in an epidemiological study is real, rather than the result of bias or confounding factors, researchers may conduct a randomized clinical trial to confirm a suspected cause-and-effect relationship.

Experimental epidemiological research, however, may lend itself to identifying and understanding cause-and-effect relationships.

Completion of the Human Genome Project in 2003 opened an entirely new toolbox for human health research. In addition to the value of knowledge about DNA variation among individuals, this knowledge is the foundation of an evolving range of investigative fields, including genetics, epigenetics, transcriptomics, proteomics, and metabolomics. These research tools are providing clues for understanding human biology, as well as food, agriculture, medicine, and a host of other impacts on health. Studies can be case-controlled, based on genotype, for example, so that researchers can hone in on maximizing beneficial and minimizing harmful effects in individuals.

_Nutrigenomics_ is the study of interactions and synergies, between nutrients consumed and genomic expression. One’s genetic makeup influences the way the body utilizes nutrients. Conversely, one’s nutritional intake can influence genomic expression. Importantly, the interactions between nutrients and genes work in both directions. Nutrigenomics may one day provide the means to truly individualize nutrition advice, based not only on preferences, lifestyle, and readiness to change, but also on one’s personal genetic information. An example of the influence this field of study has had on nutrition practice in the early 21st century relates to hyperlipidemia and low fat diet. For example, an ancillary study to the Women’s Health Initiative (WHI) is “Thrombotic, Inflammatory and Genetic Markers for Coronary Heart Disease in Postmenopausal Women: A WHI Umbrella Study.” ([http://www.whiscience.org/ancillary/all_funded_WHI_AS.pdf](http://www.whiscience.org/ancillary/all_funded_WHI_AS.pdf))

For the purposes of this module, it is important to recognize the increasing influence of genetics and genomics on human health research. For an in-depth study of the subject, the Human Genome Project Web site is an excellent starting point (HGP 2003).


_Slide provided courtesy of John A. Milner, PhD, Nutritional Science Research Group, Division of Cancer Prevention, National Cancer Institute (NCI)
If we know a person’s genetic makeup, then we may be able to suggest the specific foods or dietary components that would preempt specific diseases for that individual.

Soy, for example, is thought to exert the greatest breast cancer preventive effect in women whose mothers consumed soy foods while they were in utero, and who themselves consumed soy in the pre-adolescent years. Soy has also been shown to influence epigenetic events. Thus, if this occurs at an early stage of development, it could influence subsequent cancer risk.
Meta-analysis is the statistical statistical analysis of the combined results of many individual studies to derive overall conclusions about a question or hypothesis. Meta-analyses are conducted in an attempt to reconcile differences among studies in terms of their statistical power or sample sizes or to aggregate relevant findings across studies. Although meta-analysis is a study of existing published data, it is important that researchers approach the process as any other research study, formulating the research question, collecting and analyzing data, and reporting results (Egger, Smith, and Phillips 1997).

The procedure is most appropriate when examining studies that look at the same question and use similar methods to measure relevant variables. For example, a meta-analysis of the efficacy of folic acid supplementation for stroke prevention examined data from trials that had reported stroke as an endpoint, and those in which the subjects were randomized into intervention and control groups. There were differences in methodology, which were utilized to investigate differences in effect. Longer studies, for example, demonstrated increased benefits. (Wang, et al, 2007)

<table>
<thead>
<tr>
<th>General considerations for judging the validity of a meta-analysis include the following:</th>
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<tr>
<td>Is the objective clearly stated?</td>
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<td>Are the criteria for inclusion or exclusion of studies explicit, addressing not only the variables and data collection method, but also the characteristics of the subjects?</td>
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<td>Is the search mechanism for the determination of suitable studies adequate?</td>
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<td>Is the quality of the included trials assessed?</td>
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<td>Did the included studies randomize subjects into study groups? If not, why?</td>
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<td>Is the sensitivity of the findings analyzed?</td>
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<td>Does the discussion include mention of limitations? Does it put results into context?</td>
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<td>Are the conclusions justified by the data?</td>
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Evidence-based review is a process of reviewing and drawing conclusions about a particular area of study, based on the available evidence. There are numerous examples of this type of review available online:

- American Dietetic Association (ADA): Evidence Analysis Library (http://www.adaevidencelibrary.com/)
  1. Formulate Evidence Analysis Question
  2. Conduct Literature Review for Each Question
  3. Critically Appraise Each Report
  4. Summarize Evidence
  5. Develop Conclusion Statement and Assign Grade
- Office of Dietary Supplements (ODS), National Institutes of Health (NIH): Evidence-Based Review Program (http://ods.od.nih.gov/Research/Evidence-Based_Review_Program.aspx)
- U.S. Food and Drug Administration (FDA)
  - Qualified Health Claims (adapted ADA Evidence Analysis process; http://www.cfsan.fda.gov/~dms/lab-qhc.html)
The FDA evaluates the strength of evidence before approving use of a health claim on food labels. This graphic is adapted from the Significant Scientific Agreement diagram utilized by FDA. The important point to remember is that a body of consistent, relevant evidence from well-designed clinical, and/or epidemiologic and laboratory studies is needed in order to truly evaluate the weight of the evidence. Consistent results are meaningless if the design is flawed. And there is value in multiple types of study design. The key is to build evidence by asking the right questions at the right time. Jumping too quickly to clinical trials seems attractive at times, but has proven ineffective and inefficient in some cases. Even with a strong body of evidence, significant scientific agreement by federal scientific bodies or independent experts is needed.

It is noteworthy, however, that the FDA’s Qualified Health Claims review process allows a process for providing information to consumers during the development of the science, as long as the strength and direction of the research is appropriately explained.

The Office of Dietary Supplements (ODS) at National Institutes of Health (NIH) also emphasizes that it is not appropriate to not draw a conclusion based on evidence-based review. Little or inconsistent data, however, would generate a conclusion that characterizes the state of the science. For example, the conclusion from ODS’s review of B vitamins and berries and age-related neurodegenerative disorders follows:

- “The current research on B vitamins is largely inadequate to confidently assess their mechanisms of action on age-related neurocognitive disorders, their associations with disease, or their effectiveness as supplements. B vitamin supplementation may be of value for neurocognitive function, but the evidence is inconclusive.” (Balk et al, 2006)


Learning Guidepost 1

- The research question and design are interdependent
- Both observational and experimental research are important and complementary
  - Observational: associations
  - Experimental: cause-and-effect
  - Epidemiology, the “omics,” and other fields of study may be observational or experimental
- Randomized, double-blind, placebo-controlled studies
  - Gold standard
  - Not appropriate in all cases
  - “Omics” may require a different approach
- Consider the full body of evidence
  - Meta-analysis
  - Evidence-based review

Learning Guidepost 1:

- The research *question* and *design* are interdependent
- Both observational and experimental research are important and complementary
  - Observational: associations
  - Experimental: cause-and-effect
- Double-blind placebo-controlled studies
  - Gold standard
  - Not appropriate in all cases
  - “Omics” may require a different approach
- Individual studies should always be considered within the context of the full body of evidence on the topics that it addresses. Meta analysis and evidence-based review are two different ways to understand the big picture in an area of food or nutrition science. One or the other may be most appropriate in various circumstances. The important point is to consider the weight of the evidence.
As you read a research report, there is important information to look for and questions to ask yourself or to pose to experts. This information will be discussed with respect to each section of a research report or study:

- Abstract
- Introduction
- Method
- Results
- Discussion
- References
- Other considerations

Be aware that exactly where the information appears in different articles varies somewhat.

Critically Reviewing Scientific Studies: Abstract & Introduction

- Abstract
- Introduction
  - Background
  - Purpose of research
- Key questions to ask:
  - Adequacy of evidence review?
  - Context re: appropriate conclusions from existing relevant research?
  - Gaps identified?
  - Purpose clearly stated?
  - Research design fits purpose?

The **abstract** of a published study serves to briefly answer the basic questions about what was studied, how it was done, and the results. Its primary purpose is to allow readers to make an initial evaluation of whether a study is of interest without having to read the complete paper. Abstracts do not provide enough detail to enable readers to assess the validity of a study or put it into context.

The **introduction** provides both background information and the purpose of the research. The *background* information presented tells why the researchers think the study is important. It should reflect a comprehensive knowledge of the body of research on the subject and should brief the reader on both the previous studies that support the concepts or theories of the current study and those that do not. In essence, it brings the reader up to speed on current thinking and presents the researcher's rationale for pursuing the study. The stated *purpose* essentially defines the study. It dictates how a study was conducted: the research design, the variables measured, how information was collected and analyzed, and what conclusions may be drawn.

**Key Questions to Ask:**
- Have the authors included a thorough representation of the current body of relevant evidence?
- Does the review of existing literature provide context regarding types of studies conducted and appropriate conclusions?
- Are research gaps identified?
- Is the purpose of the research clearly stated?
- Does the research design fit the purpose?

Critically Reviewing Scientific Studies: Methods

- How the research was conducted
  - Sample
    - Clearly described? Appropriate to the research question?
    - Size appropriate to question? Clearly addressed?
    - Sampling method
  - Study groups
  - Study setting
  - Variables
  - Treatment
  - Analysis
- Limitations
- Key questions to ask

Method: The methodology section describes how the research was conducted. This section should enable critical readers to determine whether the research was adequately designed to achieve its purpose, as well as understand to whom the study results apply. Hence, the methodology section warrants careful review. Important information in the methodology section includes:

- Sample
  - Is the sample clearly described? And is the sample studied appropriate to the research question?
  - Size. The study sample should be large enough to reveal associations and/or effects. For example, when assessing the average vegetable consumption among children who participate in a school-based intervention program, several thousand children may be deemed necessary because the increase from such an intervention is likely to be relatively small. That is, the diets of the children in experimental and control groups may not differ much in terms of vegetable intake, and therefore, the effect of the intervention might not be noticed. It is easier to spot a small effect when you are looking at results for a large sample. A small sample size, however, does not necessarily mean that the study is flawed. For example, prospective clinical nutrition studies usually have just a small number of subjects because there are so many variables that need to be controlled. When reading a study, be sure to look for the rationale that the researcher used to decide the sample size.

- Sampling method. Were subjects randomly selected from the general population or a cohort? Is the description of the method complete, with limitations addressed? Among other things, the sampling method affects to whom the study results may be relevant. If the subjects are selected randomly, that is, via a procedure in which all individuals in a population being studied have an equal chance of being selected, then the study results may be generalizable to that population. True random selection within the present-day context of do-not-call restrictions on telephone numbers may be nearly impossible. Of course, demographic or other characteristics of the sample that may be skewed can be overcome through statistical “weighting” of the data, allowing projection of the results to the general population.

Critically Reviewing Scientific Studies: Methods (continued)

- **How the research was conducted**
  - Sample
  - Study groups
    - Number
    - Random assignment?
  - Study setting
  - Variables
  - Treatment
  - Analysis
- **Limitations**
  - **Key questions to ask**

**Study groups**
- Number of groups
- Assignment to groups: Were subjects randomly assigned to treatment vs. control groups? Random assignment ensures that all subjects have an equal chance of being in the experimental and control groups and increases the probability that any unidentified variable will systematically occur in both groups with the same frequency. Randomization is crucial to controlling for variables that researchers may not be aware of or cannot adequately control but that could affect the outcome of an experimental study.

**Study setting** (clinic, laboratory, population, etc). The setting may enable control of confounding factors, as a metabolic lab allows researchers to know and measure intake, output, activity, etc much more accurately than with free-living subjects. It can also be a confounding factor itself, as culture, daily stresses, and other aspects of normal daily activity are important factors to consider before extrapolating results to the general population.

**Variables**
- Are variables of interest clearly defined?
- Are potentially confounding factors clearly identified? Were they controlled and, if so, how? If not controlled, are these limitations appropriately addressed?

**Treatment**
- Was the treatment appropriate to the research question? Was the measurement method appropriate?
- How were the variables of interest measured? How were the data collected?
- What was the length of the study, including preparation, treatment, and follow-up?

**Analysis**
- How and by what statistical procedures were the data analyzed? Were the analyses appropriate to the study design and research question?

Critically Reviewing Scientific Studies: Methods (continued)

- How the research was conducted
  - Sample
  - Study groups
  - Study setting
  - Variables
  - Treatment
  - Analysis

- Limitations

- Key questions to ask:
  - Major design flaws?
  - Appropriate to answer the study questions?
  - Methodological limitations acknowledged and discussed, including possible influence on results?

A Word About Methodological Limitations: Often, limitations are placed on researchers—such as finances or the ethics of human testing—and these can severely restrict progress on a particular line of research. Aside from these external limitations, there can also be internal limitations, such as those experienced when the current state of knowledge in a field (particularly as it relates to data collection instruments) is known to be limited. Any type of constraint—if it could affect the results of the study—should be openly discussed in the methodology or discussion sections of the study.

Key Questions to Ask:

Are there any major design flaws in this study?

Were the variables, data collection methods, and statistical analyses appropriate to answer the study questions?

Were methodological limitations acknowledged and discussed?

What influence might these limitations have had on the results?

Critically Reviewing Scientific Studies: Results

- Statistical analysis of data
  - Descriptive vs inferential statistics
  - Statistical significance
    - The \( P \) value
    - Statistical power
    - Correlation coefficient
- Communicating relative versus absolute risk
- Key questions to ask

The **Results** section of a research report provides the statistical analysis of data. For more precise communication, statistical measures are frequently used to convey the existence and strength of relationships. **Descriptive statistics** present the information in an organized fashion so that it is easier to interpret (e.g., percentage, frequency, mean, standard deviation), however they do not provide information about cause and effect. **Inferential statistics**, on the other hand, allow researchers to extrapolate results for the sample studied to a larger population.

**Understanding Statistical Significance:** Researchers generally calculate statistical significance and report it as a "\( P \) value." The \( P \) value is the probability of obtaining an effect in the study sample by chance alone. Therefore, the larger the \( P \) value, the more likely the results are due to chance. If the results of a study are statistically significant, then the study may have indeed hit upon some real association or effect. A \( P \) value of less than 5 percent (\( P < 0.05 \)) is fairly common and would be considered statistically significant. This means that the result would occur by chance alone less than 5 percent of the time. More stringent levels of significance are \( P < 0.01 \) and \( P < 0.001 \).


Critically Reviewing Scientific Studies: Results (continued)

- Statistical analysis of data
  - Statistical significance
    - The $P$ value
    - Statistical power
    - Correlation coefficient
- Communicating relative versus absolute risk
- *Key questions to ask*

If the results of a study are not statistically significant, the association in question may not exist, or there may be limitations in the **statistical power** of the study, usually caused by a small sample size. It is important to remember that a statistically significant result may be detected in a very large sample, while the measured difference between the study groups is so small that it is not clinically significant. As was concluded in a panel workshop report in *Neurotoxicology* (Amler, et al, 2006), the interpretation of results must inform three types of conclusions, including, “…the medical implications for individual participants, the potential health impact on the study population, and the acceptance or rejection of the study hypotheses.” In addition, statistical significance should not overshadow the importance of an appropriately designed, and objectively conducted and interpreted study.

The **correlation coefficient** is a statistical tool that measures the degree to which variables are linearly related. Linearity is greatest (and the association strongest) when individual data points are close due to low variability in the data. It varies between $-1$ and $1$. Negative values indicate that as one variable increases, the other decreases. The closer the absolute value of $r$ is to $1$, the stronger the association; the closer to $0$, the weaker the association. It is notable that the correlation coefficient is able to show whether two variables are connected, but is *not* able to show that the variables are *not* connected. It also does not suggest a causal relationship.

Critically Reviewing Scientific Studies:
Results (continued)

- Statistical analysis of data
  - Statistical significance
    - The P value
    - Statistical power
    - Correlation coefficient
- Communicating relative versus absolute risk
- Key questions to ask:
  - What is the real/clinical and statistical significance of these results?
  - To whom do these results apply?
  - How do these results compare to those of other studies on the subject?

Absolute risk refers to the actual risk of an occurrence—the chance that a specific outcome will occur. Relative risk puts risk in comparative terms—the outcome rate for people exposed to the factor in question compared with the outcome rate for those not exposed to the factor. A relative risk of >1 indicates an increased risk of the outcome under investigation; one of <1 indicates a decreased risk of the outcome. Relative risks are the most commonly used measure of morbidity or mortality in the medical literature today. However, in many cases the absolute risk is a far more relevant statistic for the public.

For example, suppose that a study shows that a man who brushes his teeth only once a day is 50 percent more likely to have all his teeth fall out in the next 10 years than others who brush their teeth twice per day. This is the relative risk. Yet, the absolute risk that all of the man's teeth will fall out may be only 1 percent. In this case, the relative risk makes the problem—a rare one anyway—seem more important than it really is. However, relative risk can also make a problem appear to be less important than it actually is. Therefore, it is important to consider both relative risk and absolute risk when discussing study results.

Key Questions to Ask:
What is the real and statistical significance of these results?
To whom do these results apply?
How do these results compare to those of other studies on the subject?

Critically Reviewing Scientific Studies: 
**Discussion**

- **Explanation of results**
  - Limitations of study
  - Inferences

- **Key questions to ask:**
  - Conclusions supported by the data?
  - Conclusions related to stated purpose? If not, do study design and results support the secondary conclusions?
  - Are results that do not indicate associations between variables ("no effect") discussed?
  - Limitations acknowledged?

**Discussion**
The discussion section of a study often sheds new light on the results and their meaning. Alternative explanations for the results and the implications of the research may also be presented.

- One of the most frequent errors in scientific research is drawing conclusions that are not adequately supported by the data. This may occur for a number of reasons: collection of insufficient or inadequate data, overgeneralization of results, methodological problems, or inherent limitations of the study design. This is why it is important to review the methodology section.

- Sometimes, researchers stray from the scientific method by reporting conclusions that are unrelated to the research question that was tested. Although conclusions made in this manner may have merit, it is important to take a second look at whether the study was adequately designed and conducted to support the secondary conclusions.

- Finally, be wary of absolute conclusions that profess to be the final word on a subject. Good research answers some questions and raises others. A call for more research to investigate particular issues that remain unclear or to replicate the current study findings frequently concludes a journal article.

**Key Questions to Ask:**

*Are the conclusions supported by the data?*

*Are the conclusions of the study related to the stated purpose of the study? If not, do the study design and results support the secondary conclusions?*

*Are results that do not indicate associations between variables discussed, as well?*

*Are limitations acknowledged?*

Critically Reviewing Scientific Studies:
References & Other Considerations

- References
  - Thorough inclusion of relevant research
- Other considerations
  - Funding
  - Editorials and Letters-to-the-Editor

**References**: Experts in the subject area can usually tell rather quickly if key research has been omitted from the reference list. If this is the case, the researchers may have failed to adequately review, consider, and evaluate prior work in the field that could have benefited their current study. Also, a reference list that includes both older and newer relevant research can reassure the reader that the author has thoroughly reviewed the entire body of research for background and has not just considered the last few or first few studies conducted on the topic.

**Other Considerations:**

**Funding Source**: Often, one hears a study being criticized—or its findings dismissed entirely—because it was funded by industry or another interested party. Scientific journals require that potential conflicts of interest be disclosed and sources of funding be referenced at the end of a paper. Although it is interesting to note the funding source of a study, it would be inappropriate to simply negate the results solely on the basis of the funding source. A critical evaluation of research on its own merit is the best way to assess its validity and importance. If the study is good, its results will stand up to scrutiny.

**Editorials and Letters-to-the-Editor**: Editorials—or written opinions by experts in a field other than the authors of a study that the editorial addresses—may be one of the most valuable ways for readers to understand a study, its meaning, and its practical implications. Editorials often provide perspective on a study, discussing it in the context of other research, as well as identifying potential limitations that may affect the applicability or even veracity of the study results.

Although letters to the editor usually appear in issues following that in which a study is published, if a reader has the time to wait, such letters can be very useful to help identify potential problems with a study. At the least, they can be used as a continuing education tool on what to look for when critically reviewing studies. Study results that are reported via letters to the editor, however, should not be taken at face value. They cannot substitute for peer-reviewed articles that provide the details necessary for readers to critically review the research.

Challenges Unique to Food and Nutrition Science

- **Measurement difficulties**
  - Food and dietary supplement intake
- **Clinical significance**
- **“Reductionist” vs. “holistic” approaches**
  - Isolating action of bioactives to understand mechanism
  - Whole diet approach to overall health

There are challenges that are unique to any particular field of research. Challenges specific to food and nutrition science include:

- **Measurement difficulties:**
  - Actual food intake is most accurately measured when subjects eat in a metabolic kitchen, where researchers prepare and serve the food, watch the subjects eat their food, and measure waste. It is very difficult to ascertain food intake with 100 percent accuracy—which is often one of the important variables of interest. In addition, it is important to note the contribution of dietary supplement intake as well.
  - Surveys of food intake may rely on a food frequency questionnaire (FFQ), 24-hour recall, and/or food diary. These methods rely on subjects’ memory, honesty, and ability to accurately quantify intake.

- **Clinical significance:** The value of human data cannot be understated, particularly at the stage of making recommendations for human health. As with all research aimed at maintaining or improving human health, in vitro and animal data are highly valuable and informative, but not conclusive. At the same time, certain types of research, such as toxicity testing, cannot ethically be conducted on humans.

- The **“reductionist” vs. “holistic” approach** is quite prominent in nutrition research debates, although this issue is significant for any health research field. The reductionist approach seeks to isolate the action of particular bioactives with respect to particular physiological responses. These studies provide an important contribution to understanding mechanisms, cause/effect relationships, dose/response, and toxicity. At the same time, there are multifactorial impacts on health, both within the food of interest (multiple nutrients, antinutrients, etc) and beyond food (physical activity, genetics, etc). The holistic approach is also referred to as the “whole diet” approach, seeking to understand the complex dynamics that are observed in free-living situations, where various components of the diet have synergistic or inhibiting effects on each other. It seeks to understand why and how overall health, or even a particular health outcome, are impacted not only by diet, but also by other environmental factors and genetics. Neither end of this spectrum is ideal. Rather, it is important to recognize the strengths and weaknesses of each, and the importance of each one to the other.
Providing Context

- Become familiar with the body of evidence
- Consult with other researchers and/or health professionals
- Ask:
  - Are the findings additive to the current body of evidence?
  - Are the findings contradictory? Suggestive of a new direction?
  - Are there important references that have been left out? Are the referenced studies of high quality?

Evaluating individual studies is a valuable skill. It is a process that cannot be practiced in isolation from the broader body of evidence that exists on a given topic, or in isolation from other professionals in the field. Certain questions can be answered only by someone with extensive knowledge of the available research, or in some cases, by a panel of scientists with expertise in different aspects of the topic of interest. However, the reader should ask certain questions in order to understand a given study within this broader perspective, including:

- Are the findings additive to the current body of evidence?
- Are the findings contradictory? Suggestive of a new direction?
- Are there important references that have been left out? Are the referenced studies of high quality?

Again, consultation with other researchers or health professionals is a valuable tool to utilize in giving the individual study the necessary context. Forming a journal club and attending scientific conferences are two approaches to improving these skills.
When critically reviewing a study:

- Aim to become familiar with the broader body of evidence.
- Give particular attention to Methods.
- Look for consistency among research purpose, design, methods, results, and conclusions.
- Consider weaknesses of the study, as well as limitations inherent in all research.
- Connect with other professionals to deepen understanding of the evidence.
Calcium and vitamin D together provide an interesting and continually unfolding case study on the evolution of dietary advice regarding food components and their health benefits.

- There is strong consensus regarding the important role of calcium in maintaining bone health and reducing the risk of osteoporosis. The FDA approved a health claim for food and dietary supplement labels in 1993, meaning that the evidence for calcium and osteoporosis was deemed to meet the “significant scientific agreement” standard (CFSAN 1994). Based on significant advances in understanding the role of vitamin D in ensuring adequate calcium absorption, and bolstered by the critical reviews provided by the Surgeon General’s report on Bone Health and Osteoporosis and the 2000 NIH Consensus Statement on Osteoporosis, Prevention, Diagnosis and Therapy, the FDA announced in January 2007 its plans to add a new health claim on calcium and vitamin D working together to reduce osteoporosis risk (CFSAN 2007).

- In contrast, the study of the relationship of these micronutrients to cancer is emerging and still in its infancy. For this reason, the FDA allowed a qualified health claim for the relationship between calcium and colorectal cancer (CRC): “Some evidence suggests that calcium supplements may reduce the risk of colon/rectal cancer, however, FDA has determined that this evidence is limited and not conclusive.” This decision was impacted, according to the FDA, by several factors: 1) it uses in vitro and animal studies as background information only; 2) 48 of the 50 intervention studies reviewed did not meet criteria for drawing conclusions regarding the nutrient/disease relationship for a variety of reasons, including inadequate control of confounding factors, neglecting to measure a validated surrogate endpoint of colon/rectal cancer; and 3) only one of the two quality trials found a statistically significant reduction in relative risk of recurrence of colon polyps with calcium supplementation. (CFSAN 2005)

- Vitamin D is also being examined in relation to cancer risk, with evidence emerging regarding a potentially protective effect against cancer, particularly prostate and colon. While preliminary evidence has been supportive of an association, these considerations have raised further questions about not only appropriate biomarkers of vitamin D status, but also appropriate sources of vitamin D (balancing sun exposure against skin cancer risk, and concerns regarding potential toxicity of dietary supplements), and subpopulations that would benefit the most versus bear the greatest risk of increased vitamin D intake.

- Regarding calcium and vitamin D, the emerging evidence paints a complex picture of interrelationships among nutrients and among risk factors for various diseases, as well as the balance between driving for optimal health while avoiding toxic overexposure to nutrients.


In 1996, the FDA approved a health claim for folic acid: “Healthful diets with adequate folate may reduce a woman's risk of having a child with a brain or spinal cord defect.” (CFSAN, 2004) This was the same year that FDA mandated folic acid fortification (FAF) of enriched grain products.

Since then, scientific discovery and debate have continued. Few dispute the value of preventing neural tube defects (NTDs), which is supported by clinical data. Debate has centered on whether fortification is the appropriate route for public health intervention, since it provides increased levels of folic acid to both those who are in need of higher intakes and those who may be at risk due to higher intakes.

This conundrum is playing out in the observational evidence emerging regarding the impact of FAF. On the one hand, pregnant women and their babies in the first trimester have benefited from a decline in NTDs, which was found to be associated with FAF in one study (Honein, et al, 2001). On the other hand, older men at risk for CRC may not benefit from FAF, as observational research has also demonstrated an association between FAF and CRC rates (Mason, et al, 2007). The CRC rate study provides an example of a case-control observational study. The authors state, “These observations alone do not prove causality but are consistent with the known effects of folate on existing neoplasms, as shown in both preclinical and clinical studies.” This statement appropriately explains that the value in observational data is in its ability to support and provide historical context to experimental data.

Research continues to reveal potential promise for folic acid and health, ranging from cancer prevention (observational data) to cardiovascular disease (CVD) risk reduction. Questions to be addressed include the appropriateness of the biomarkers used (homocysteine’s relation to CVD is unclear), and subpopulations that would benefit the most (pregnant women; those with a particular genotype) versus bear the greatest risk (older adults, for whom colon cancer risk increases). The importance of interrelationships among nutrients and risk factors for disease, and the balance between driving for optimal health while avoiding overexposure present challenges in not only conducting, but also interpreting and communicating nutrition science to the public.

Once a strong foundation of scientific understanding is established, statistics and inferences have the potential to have a positive influence on public health…if communicated in a way that is meaningful to the consumer.
Knowing Your Audience

- Who is your “consumer”?  
  - Motivating behavior change  
  - Value of consumer research  
    - Quantitative surveys  
    - Qualitative focus groups

Understanding the consumer is the vital first step in developing a successful consumer communication strategy. The findings of a study or body of evidence should not be changed to simply tell the individual what he or she wants to hear. However, understanding what appeals to or motivates a person may shed light on ways to communicate the findings in order to elicit behavior change.

What do they value? What are their health needs and their perceived needs and desires? What do they want from food? How do they define health or wellness? What are their barriers to change? What motivates them to change? Also, keep in mind that “consumers” of the nutrition information you deliver include not only your patients or clients, but also your colleagues (doctors, nurses, food service providers, etc), journalists, and many others that you communicate with from day to day.

The following slides detail consumer research findings, conducted in 2007. Such studies provide information that can serve as a baseline for food and nutrition communications with the general population. A few details about the research:

- The IFIC Foundation Food & Health Survey was a Web-based survey of 1,000 American adults (IFIC Foundation, 2007).
- The IFIC Consumer Attitudes toward Functional Foods/Foods for Health trending research includes a Web-based quantitative survey of 1,000 American adults (IFIC 2007).


Bridging from Interpretation to Communication

Communicators are challenged to:
- Convey emerging science on a continuum, based on overall evidence.
- Communicate the latest scientific findings with balance.
- Provide context to evidence that supports or contradicts the current body of research.
- Educate the public about new areas of research or technology.

The challenge of bridging from interpretation of research to communicating it effectively is inherent to all science communications. Communicators are challenged to:

- Convey emerging science on a continuum, based on the strength of the overall evidence, as opposed to isolated studies.
- Communicate the latest scientific findings with balance, while recognizing, but not overstating, differences of opinion.
- Provide context when new or emerging scientific evidence adds to and supports the body of research currently available or when the emerging science contradicts previous research, questioning established dietary guidance.
- Educate the public about a new area of research or technology, including complex terminology, before related nutrition information is likely to be understood.

Communicating about Functional Foods and Food Components for Health

- Not “magic bullets”
- Consuming enough of beneficial components, within given calories
- Getting the right health information to the right people– Individualize!

For example, one area of nutrition involves understanding dietary components that impact health, referred to commonly as “functional foods” or “bioactives for health.” Communicating this area of research presents the following challenges:

- Empowering consumers to view beneficial dietary components as one part of a healthful diet and lifestyle rather than as “magic bullets.”
- Balancing increased consumption of beneficial components within the proper caloric intake necessary to maintain a healthful weight.
- Communicating which segments of the population would likely benefit from increased or decreased consumption of a given component.
What do consumers consider important in the health equation? Clearly, consumers agree that diet, weight, and physical activity are each influential on a person’s overall health (90%, 91%, and 94%, respectively).

Survey question: What influence, if any, does each of the following factors have on a person’s overall health? *By “diet”, we mean everything you consume, including foods, beverages, and dietary supplements. (n=1000)

And most consumers indicate that they are trying to improve the healthfulness of their diets in order to improve overall well-being (70%), improve physical health (65%), and/or lose weight (70%).

Survey question: For which of the following reasons, if any, are you trying to improve the healthfulness of your diet? (2007 n=660; 2006 n=574)

The majority of Americans continue to agree that certain foods have health benefits that go beyond basic nutrition.

Survey question: Now a few questions about food. Each time we use the word “food,” we are referring to everything people eat, including fruits, vegetables, grains, meats, dairy, as well as beverages, herbs, spices and dietary supplements. Do you disagree or agree that certain foods have health benefits beyond basic nutrition? (n=1000)

Consumers state that the greatest influence on their purchase decisions is taste (88%), with price (72%) and healthfulness (65%) coming in second and third. It is noteworthy, however, that there have been increases in those who identify healthfulness as an important influence on their purchasing behavior.

Survey question: How much of an impact do the following have on your decision to buy foods and beverages? (n=1000)

Consumers clearly believe that certain foods and beverages can positively impact health.

- Four out of five believe foods can improve heart health.
- More than three-quarters believe foods contribute to overall health and wellness, improving physical energy or stamina, and/or improve digestive health.
- Approximately two-thirds perceive potential benefits related to improving immune function, providing higher levels of satiety, improving mental performance, reducing risk of disease, and diminishing current health problems.

Survey question: To what extent do you agree or disagree that some specific foods or beverages can provide the following benefits? (n=1000)

Americans remain highly interested in learning more about functional foods.

Almost half (41%) of Americans are “very interested” and another 43% are “somewhat interested” in learning more about functional foods.

Improving public health, however, will never be realized through information alone, but rather when individuals are motivated to apply what they know to their lives.

Survey question: In general, how interested are you in learning more about foods that have health benefits beyond basic nutrition?  (n=1000)

What Consumers Hear: The State of Food in the News

- Food is big news
- Americans get more health information from mass media than healthcare professionals
- Accuracy and helpfulness inconsistent
- Underreporting of contextual elements

Whether providing patient counseling or delivering a media interview, it is important to understand the information environment. What are consumers exposed to in their every day lives?

Media trends have demonstrated that one thing remains consistent: food is big news (IFIC Foundation 2005). And Americans will readily admit they get more of their health information from the mass media than from healthcare professionals (IFIC 2007). But the accuracy and helpfulness of this advice can be debated, due to the consistent lack of context in news coverage (IFIC Foundation 2005). The Food for Thought research has found that journalists are very good at telling the "what" of a food and health story, but often leave off "to whom" does the advice apply, "how much" is needed, "how often" should the advice be followed, and "what are the consequences" of following the advice, as well as what the key elements of the underlying research are. Whether due to time or space constraints, journalists may oversimplify the reporting of science-based food and health news, bringing about a situation in which consumers cannot judge the relevance of the information for their own diet, lifestyle, and nutritional needs.


The advent of the Internet has made information, good and bad, readily available to the average American. This, of course, includes nutrition information. Searching Google for “health and wellness” produces over 35 million hits. The reality is that consumers get information from an increasingly diverse range of sources. As discussed, dietetic professionals may communicate with clients in a variety of settings. The power of the Internet in disseminating information, as well as the challenges with being heard in this venue, are important considerations for nutrition communicators.
### Learning Guidepost 3

Communicators challenged to convey:
- Continuum of science
- Balance
- Context
- New technologies

Know your audience
- Consumer research
- Individualization

Stay connected with consumers’ information environment
Guidelines for Making Research Relevant to Consumers

IFIC Foundation/Institute of Food Technologists (IFT) Guidelines for Communicating the Emerging Science of Dietary Components for Health

- Multidisciplinary Advisory Committee
- Goal: Effective communication of food and nutrition science for the public good
- Guide communications with the public, and among stakeholders

Building on a foundation of appropriately interpreted science and understanding of the consumer, dietitians can help to bridge the gap between the science and effective communication with the consumer.

To that end, the IFIC Foundation/Institute of Food Technologists (IFT) Guidelines for Communicating the Emerging Science of Dietary Components for Health were developed in 2002, guided by a multidisciplinary Advisory Committee. The Guidelines are designed to address the challenges in this arena and stimulate reflection among all stakeholders, leading to accurate and effective communications. Individualization is the key not only in nutrition advice, but also in nutrition communications. Therefore, not all guidelines will apply in all situations, but each will apply in some.

These Guidelines can also serve as a bridge between the communicators using them—between journalists and research scientists, or health professionals and government officials. For example, a journalist may find that the Guidelines serve as a checklist in interviews with research scientists and vice versa. By facilitating recognition of the value of information each communicator can provide, an understanding of each one’s limitations, and respect for the diverse communication styles of each, application of the Guidelines will allow a more understandable and consistent message to reach the consumer.

Following is an overview of the 7 Guiding Principles for Communication, along with examples of applying them to food and nutrition communication.

Enhance public understanding of foods, food components, and/or dietary supplements and their role in a healthful lifestyle. Serve-up plain talk about food and health. Advise consumers that dietary components are not “magic bullets” that work alone, but may promote good health when included as part of a healthful diet and lifestyle.

Example: Most Americans would benefit from increasing dietary fiber intake. Whole grain rice, pasta, breads, and cereal are a great source of fiber, as well as many other nutrients.

**Communication Guidelines**

**PRINCIPLE:** *Scientific research is evolutionary, not revolutionary.*

**EXAMPLE:** *Although research has found an association between vitamin D and reduced risk of prostate cancer, more studies are needed to determine if there is a cause-and-effect relationship, and how much vitamin D is both effective and safe for various populations.*

Clearly convey the differences between emerging and consensus science. *Scientific research is evolutionary, not revolutionary.* Tell consumers where new findings fall on the research continuum and within the overall body of evidence.

Example: *Although research has found an association between vitamin D and reduced risk of prostate cancer, more studies are needed to determine if there is a cause-and-effect relationship, and how much vitamin D is both effective and safe for various populations.*

Communication Guidelines

**PRINCIPLE:** Carefully craft your communications.

**EXAMPLE:** Most research indicates that there are overall health benefits from antioxidant-rich foods consumed in the diet. The results of clinical trials with antioxidant supplements have yet to provide conclusive indication of health benefits.

Communicate with accuracy and balance. Carefully craft your communications. Advise a healthy skepticism for potentially misleading phrases, such as “medical miracle” or “scientific breakthrough.” Suggest looking beyond dramatic language to get the full story. Explain that facts are facts, but experts may differ in opinion about how to interpret them. Present a complete picture of a study’s results, rather than select findings.

Example: Most research indicates that there are overall health benefits from antioxidant-rich foods consumed in the diet. The results of clinical trials with antioxidant supplements have yet to provide conclusive indication of health benefits.


Communication Guidelines

**PRINCIPLE:** Make your messages meaningful.

**EXAMPLE:** If you have cardiovascular disease, there is strong evidence that you would benefit from consuming omega-3 fatty acids in fish and fish oils. Expert advice suggests consuming two healthfully-prepared, fish meals per week.

Put new findings into the context needed for an individual to make dietary decisions. Make your messages meaningful. Translate the latest research into what is on the consumer’s dinner plate. Spell out to whom new findings apply and what impact, if any, the findings may have on eating habits.

Example: If you have cardiovascular disease, there is strong evidence that you would benefit from consuming omega-3 fatty acids in fish and fish oils. Expert advice suggests consuming two healthfully-prepared, fish meals per week.


Communication Guidelines

**PRINCIPLE:** Cite the study specifics.

**EXAMPLE:** The study found that individuals who are overweight, diabetic, and consume more calcium on a low calorie diet may lose more weight than those who consume less calcium and the same amount of calories. Because the main study was designed to assess weight loss with different dietary patterns, it is important to note that the study did not find any differences in dairy food intake between those groups.

Disclose all key details about a particular study. Cite the study specifics. Discuss the research study design (such as characteristics of participants and quantity of food component consumed) to help the public understand the results and their validity.

**EXAMPLE:** The study found that overweight, diabetic individuals who consume more calcium on a low calorie diet may lose more weight than those who consume less calcium and the same amount of calories. Because the main study was designed to assess weight loss with different dietary patterns, it is important to note that the study did not find any differences in dairy intake between those groups.


Communication Guidelines

PRINCIPLE: Point out the peer-review process.

EXAMPLE: The promise of genomics for improving dietary interventions for treating hyperlipidemia is convincingly reviewed in the editorial. The verdict, however, should be reserved until results from more high quality intervention studies are available.

Consider peer review status. Point out the peer-review process as a key measure of a study’s credibility, although it is not the only key. Whether the study has been through the peer-review process is not a guarantee of conclusive results—it is one piece of a larger puzzle made up by the overall body of evidence.

EXAMPLE: The promise of genomics for improving dietary interventions for treating hyperlipidemia is convincingly reviewed in the editorial. The verdict, however, should be reserved until results from more high quality intervention studies are available.


Communication Guidelines

**PRINCIPLE:** When assessing a study’s objectivity, consider the full facts.

**EXAMPLE:** Some of the authors of the Women’s Health Initiative dietary intervention study disclosed past receipt of grants from the pharmaceutical industry. The objectivity of the study, however, is clear in the careful conduct and reporting of the research, as well as the appropriateness of the conclusions with respect to the research purpose and design.

**Assess the objectivity of research.** When assessing a study’s objectivity, consider the full facts—including not only disclosure of funding sources, but also the peer-review process, methodology, and conclusions.

**EXAMPLE:** Some of the authors of the Women’s Health Initiative dietary intervention study disclosed past receipt of grants from the pharmaceutical industry. The objectivity of the study, however, is clear in the careful conduct and reporting of the research, as well as the appropriateness of the conclusions with respect to the research purpose and design.


Summary

• Interpretation
  • Begins with understanding the scientific process & types of research design
  • The question, design, and conclusions of a study are interdependent
  • Context of broad body of evidence

• Cross-cutting fields of study
  • Integration across disciplines
  • New understanding and new challenges

• Bridging from interpretation to communication
  • Know your audience
  • Understand the information environment

• 7 Guiding Principles for effective communication
  • Tools for success!

Appropriate interpretation of food and nutrition science begins with understanding the scientific process and what we learn from various types of studies. Individual studies should be read with a critical eye for congruence among the research question or stated purpose, the research design, and the conclusions. Finally, individual study results should be placed within the context of existing research, both in the introduction to the paper and the discussion, as well as through meta-analysis and expert review of the evidence in the long term.

Cross-cutting fields of study, such as epidemiology and genomics, provide an opportunity to integrate information across disciplines, and across both observational and experimental approaches to research. Genomics is expanding our capacity to understand nutrition, while it is also challenging assumptions and illuminating new problems to be solved.

Effective bridging from interpretation to communication requires listening to and understanding your audience, whether a patient or the public at-large, and understanding the information environment that consumers are exposed to day-to-day.

The 7 Guiding Principles for effective communication from the IFIC Foundation/IFT Guidelines laid out in this module provide a means of integrating scientific and consumer knowledge for effective communication. Other resources can be found at the IFIC Foundation’s Tools for Effective Communication Web site (http://ific.org/tools/intro.cfm).
In order to receive CPE credit for this module, please complete the learning assessment questionnaire and then check your answers at http://IFIC.org/adacpe/. Print the Certificate of Completion for your files.

In addition, please share your feedback with IFIC Foundation by completing the evaluation of this learning module online.