# A LANDSCAPE ANALYSIS OF THE AMERICAN SOCIETY FOR NUTRITION'S JOURNALS

# TABLE OF CONTENTS

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**Landscape Analysis of ASN Journals**

# BACKGROUND

Due to government processes and limited resources, .gov websites tend to be delayed in communicating published nutrition research and emerging scientific topics. This is certainly the case for nutrition science, with online information regarding diet and disease, various physiologic endpoints, and nutrients often being incomplete or not up-to-date. It is especially concerning given the high degree of trust that health professionals and consumers place in the government as a source of credible information. The 2022 International Food Information Council Food & Health Survey rates government agencies in the top 5 trusted sources among consumers regarding what to eat. In fact, trust in government agencies significantly increased over the previous year. Other top sources of food and nutrition information include registered dietitian nutritionists, other healthcare professionals, and health coaches, as well as reading scientific studies.

Therefore, the federal government is a key player in funding and communicating sound nutrition science, as well as providing authoritative food and nutrition policy and guidance. When government websites do not have up-to-date content, it can put consumers, as well as health professionals communicating with consumers at a disadvantage. Further, organizations required to use federal government resources as the basis for substantiating the information they convey may be inadvertently limited in what or how they communicate nutrition messages.

The leading professional organization of nutrition scientists is the American Society for Nutrition (ASN). ASN publishes four journals which highlight basic, clinical, and emerging nutrition science research:

- The Journal of Nutrition (JN),
- The American Journal of Clinical Nutrition (AJCN),
- Advances in Nutrition (AN), and
- Current Developments in Nutrition (CDN).

Reviewing publications in these journals in recent years may provide insight into important research topics and identify areas of significant scientific study for government departments and agencies to consider in their informational and educational efforts.

# METHODOLOGY

Nutrition on Demand (NOD) completed a landscape analysis of ASN's journals, on behalf of the Hass Avocado Board's Avocado Nutrition Center, to determine what endpoints and biomarkers have been studied most in recent years and how these topics align with information on government websites. NOD evaluated articles published in the last three years – specifically from January 2019 through November 2021 – in each ASN journal.

The following steps were taken for this review:

### STEP 1   Develop List of Topics

NOD developed a list of endpoints and biomarkers for the Avocado Nutrition Center to review; this list was revised based on feedback (see Appendix)

### STEP 2   Track Mentions of Key Terms

NOD counted each article that mentioned the key terms from the aforementioned list in each journal

- Two NOD staff members independently reviewed article titles and abstracts and tallied the number of articles related to the key terms in each issue of each journal
- A third NOD staff member provided quality control and resolved any discrepancies between the two reviewers' counts
- In a few cases, the third staff member obtained different counts than the prior two reviewers; so, a fourth staff member reviewed those topics (which resulted in consensus)

### STEP 3   Analyze the Mentions

NOD analyzed the data obtained for the key topics

### STEP 4   Assess .gov Websites

NOD assessed what information is available on .gov websites for the top ten topics
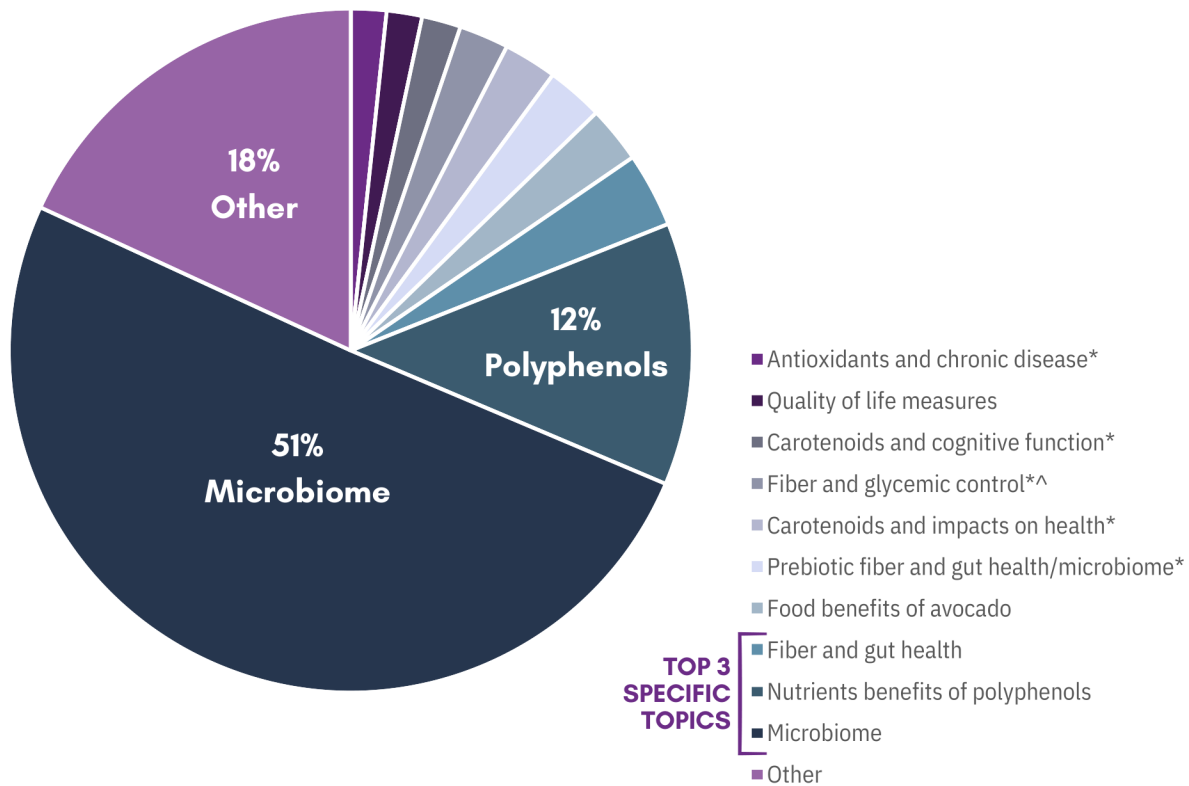
### STEP 5   Summary Findings

NOD created a brief summary of the findings, which is detailed on the following pages

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**Landscape Analysis of ASN Journals**

# FINDINGS

**Top topics published in ASN journals**

The microbiome overwhelmingly was the topic with the most publications overall (**Figure 1**) and in each journal individually (**Table 1**). Across all four ASN journals, together, the second most published topic was the nutrient benefits of polyphenols, followed by fiber in the context of gut health. Fifty-one percent of topic mentions related to the microbiome; while 12% were for polyphenols and 4% were for fiber and gut health. Mentions of consuming avocado, prebiotic fiber and gut health/microbiome, and the impact of carotenoids on health each contributed 3% to the total topics examined. The remaining four topics in the top ten were: fiber and glycemic control, carotenoids and cognitive function, quality of life measures, and antioxidants and chronic disease (**Figure 1**).

### Figure 1. Primary Topics Mentioned in ASN Journals in the Past Three Years



Legend:
- Antioxidants and chronic disease*
- Quality of life measures
- Carotenoids and cognitive function*
- Fiber and glycemic control*^
- Carotenoids and impacts on health*
- Prebiotic fiber and gut health/microbiome*
- Food benefits of avocado

TOP 3 SPECIFIC TOPICS
- Fiber and gut health
- Nutrients benefits of polyphenols
- Microbiome

- Other

*Related to nutrient benefits
^Captured mentions of fiber with regard to type 2 diabetes, glycemic control, insulin sensitivity, insulin resistance, and glycemic load

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**Landscape Analysis of ASN Journals**

# FINDINGS

When evaluating each journal individually (**Table 1**), the second most common topic published was the nutrient benefits of polyphenols. The third most common topic varied by journal: the impact of carotenoids on health for AN and AJCN, prebiotic fiber and gut health/microbiome for JN, and fiber and gut health for CDN.

### Table 1. Primary Topics Mentioned in ASN Journals in the Past Three Years by Year and Journal

| Journal | Topic #1 | Topic #2 | Topic #3 |
|---|---|---|---|
| **2019** | | | |
| Advances in Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Vegetarian and T2DM/glycemic control/insulin sensitivity/insulin resistance/glycemic load |
| The American Journal of Clinical Nutrition | Microbiome | Fiber & gut health | Nutrients Benefits - Polyphenols |
| The Journal of Nutrition | Microbiome | Nutrients Benefits - Prebiotic fiber and gut health/microbiome | Nutrients Benefits - Fiber and T2DM/glycemic control/insulin sensitivity/insulin resistance/glycemic load |
| Current Developments in Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Food Benefits - Avocado |
| **2020** | | | |
| Advances in Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Nutrients Benefits - Carotenoids and impacts on health |
| The American Journal of Clinical Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Nutrients Benefits - Prebiotic fiber and gut health/microbiome |
| The Journal of Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Food Benefits - Avocado |
| Current Developments in Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Fiber & gut health |
| **2021** | | | |
| Advances in Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Nutrients Benefits - Carotenoids and T2DM/glycemic control/insulin sensitivity/insulin resistance |
| The American Journal of Clinical Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Nutrients Benefits - Carotenoids and impacts on health |
| The Journal of Nutrition | Microbiome | Fiber & gut health | Nutrients Benefits - Polyphenols |
| Current Developments in Nutrition | Microbiome | Nutrients Benefits - Polyphenols | Nutrients Benefits - Fiber and T2DM/glycemic control/insulin sensitivity/insulin resistance/glycemic load |

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**Landscape Analysis of ASN Journals**

# FINDINGS

**Trends in topics over time**

This analysis demonstrated that the same top topics have persisted over time. The microbiome was the most frequently published topic over the three-year period both when assessing each year individually, and when looking at mentions over the total time frame. Additionally, it was the top topic in each of the four ASN journals, when considering them alone, for each year (**Table 1**). When considering all four ASN journals together, the nutrient benefits of polyphenols was the second most published topic in 2019, 2020, and 2021; however, there was some variation when looking at the individual journals. Fiber and gut health was the second most common topic for AJCN in 2019 and JN in 2021; while, the relationship between the nutrient benefits of prebiotic fiber and gut health/microbiome was the second topic for JN in 2019.

**Comparison between published topics and government websites**

The top 10 topics published in 2019 through 2021 were:

- Microbiome,
- Nutrient benefits of polyphenols,
- Fiber and gut health,
- Food benefits of avocado,
- Prebiotic fiber and gut health/microbiome,
- Carotenoids and the impact on health,
- Fiber and glycemic control,
- Carotenoids and cognitive function,
- Quality of life measures, and
- Antioxidants and chronic disease.

Overall, there was a paucity of information on government websites for the top topics published in the four ASN journals in the past three years. Compared to other top topics, federal government departments and agencies containing microbiome content on their websites were varied and disparate (e.g., Department of Energy, Environmental Protection Agency, Forest Service, Department of Veterans Affairs (VA)). Subsequently, .gov webpages discussing the microbiome were largely: 1) preliminary (outdated, archived pages discussing microbiome as an emerging topic); 2) standalone (e.g., an archived webinar); 3) isolated calls for grant proposals; 4) measurement-oriented (describing approaches to standardize measurement; datasets); 5) focused on antibiotic resistance or specific microbes (particularly those that are pathogenic); or 6) tangential to diet and health (e.g., environmental/soil microbes). The National Institutes of Environmental Health Sciences page describing the research it funds was one of the few that made the connection between the human microbiome and diet and/or diet-related chronic diseases. This page cited research that high-fat diets can increase the risk of weight gain and obesity in mice. Finally, there was an Interagency Microbiome Strategic Plan (2018-2022) to guide the coordination of microbiome research. Notably, the .gov page that was most relevant and comprehensive from the standpoint of diet and nutrition was on the Department of Veterans Affairs' website and was found on page three of a Google search.

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**Landscape Analysis of ASN Journals**

# FINDINGS

When gut health and fiber were the search terms, .gov website results were more targeted to food and nutrition. Still, only a handful of departments and agencies cover this topic, and most information was tangential and/or at a high level (e.g., FDA labeling Q&A, list of foods containing fiber in *Dietary Guidelines for Americans*, and a description of various digestive conditions) and not readily actionable for how to consume more fiber with regard to gut health, including what foods to choose more often. The most relevant and comprehensive source for the purposes of this report was found on the Department of Commerce's National Institute of Science and Technology website in the form of a meta-analysis published in The Journal of Nutrition. No new resources arose when searching "prebiotic fiber and gut health." Only one new resource arose when the search was shortened to prebiotic fiber – a WIC Works nutrition education piece.

A search related to fiber and glycemic control (and/or type 2 diabetes, insulin sensitivity, insulin resistance, and glycemic load) generated limited resources from NIH, NIH's National Library of Medicine (NLM) MedlinePlus, the VA, and CDC. The focus of these pages included the explanation of the glycemic index, how it relates to diabetes, and/or the glycemic index of foods. There were many research studies on PubMed related to fiber and glycemic control.

When performing a search related to the benefits of avocado, limited information was available from Federal government agencies and departments. Notably, the most detailed information was from state governments (e.g., South Dakota and Florida) and highlighted the nutrients in avocado (e.g., fiber, vitamins, and minerals). Many state and Federal government webpages provided avocado recipes but do not include scientific information. Yet, there were studies on PubMed evaluating the health effects of consuming avocado.

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# FINDINGS

Limited information was available on carotenoids and health impact as well as antioxidants and chronic disease. The two webpages with information on carotenoids focused on vitamin A and were from NIH (i.e., Office of Dietary Supplements and MedlinePlus). There were three government websites that address antioxidants in the context of chronic disease – all of which were also part of the NIH (i.e., National Cancer Institute, National Center for Complementary and Integrative Health, and Medline Plus from the National Library of Medicine). This information was fairly general in nature, summarizing what antioxidants are, what foods provide them, and broad relationships to chronic disease.

Significantly, there were no government websites found, other than PubMed, which provide information related to the nutrient benefits of polyphenols (the second most published topic in ASN journals) or carotenoids and cognitive function. Yet, there were many research studies on PubMed exploring the relationships between polyphenols and various carotenoids, individually or as a whole, and health.

All website mentions of health-related quality of life (HRQOL) were from HHS, and largely through the lens of the social determinants of health. Population-wide applications of HRQOL were found through the Office of Disease Prevention and Health Promotion (ODPHP) (in the context of Healthy People) and the Centers for Disease Control and Prevention (CDC). HHS had a 2018–2022 department-wide strategic plan for strengthening the social well-being of Americans across the lifespan. None of the sub-objectives were diet- or physical activity-related, nor related to the prevention of chronic disease.

**Strengths and limitations**

Our analysis has several strengths. To our knowledge, this is the most recent evaluation of the top topics published in four of the world's leading nutrition research journals. The search and review process was robust, including an initial review by two independent reviewers. In addition, the list of topics was extensive and covered a wide range of health outcomes and conditions that impact most individuals directly and/or indirectly. However, it should be noted that the list of terms and topics was not exhaustive of all those published in the journals. Moreover, despite the rigorous review, the potential for human exists.

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**Landscape Analysis of ASN Journals**

# CONCLUSION

The evaluation of ASN's four journals indicated that in a recent three-year time period the leading nutrition research topics published relate to:

## Microbiome

A key interface between the body and the environment which accumulating research demonstrates has impacts on health

## Polyphenols

A family of phytonutrients which previously were understudied and do not have established Dietary Research Intakes

## Gastrointestinal Health

The interplay of gastrointestinal health and risk for chronic diseases, with a focus on fiber/prebiotic fiber and glycemic control

This landscape analysis of ASN's journals and government websites allowed us to identify gaps between recent nutrition research publications and online government content. Notably, little to no information was available on government websites related to widely published topics in nutrition including polyphenols, antioxidants, and carotenoids in relation to health and cognitive function. Further, when there was information on a topic, such as fiber and gut health or glycemic control, it was often at a high level and not readily actionable for consumers such that they know what foods align with these health topics and how to create a healthy eating pattern, like avocados.

In contrast to some of the other topics above, the microbiome was more widely addressed on federal government websites; however, it is a broad topic, and the majority of the agencies discussed it from perspectives outside of food and nutrition. Very limited nutrition science, outside of PubMed, and consumer information were available and when it was, it was of a general nature.

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**Landscape Analysis of ASN Journals**

# NEXT STEPS

With the evolving nature of scientific research and high interest in diet and nutrition, and readily accessible nutrition advice on the Internet, it is incumbent on all of us to work together to ensure that accurate medical, health, and nutrition information is available to the public from sources they trust most.

> *"All hands on deck" are needed to ensure that a void in information from authoritative sources is not filled with potentially inaccurate information from unreliable sources.*

Ideally, these findings will be used by nutrition stakeholders to determine what information should be included on trusted websites so that they are consistent with current scientific knowledge and beneficial to the advancement of nutrition and public health.

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# ACKNOWLEDGEMENTS

## Contact

**Nutrition On Demand**

1727 N. Edison St, Arlington, VA, 22207

814.360.5387

www.nutritionondemand.net

info@nutritionondemand.net



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**Diabetes**
- Macronutrient distribution
- Actions of specific nutrients (protein, dietary fat, fiber)
- Glycemic index
- Glycemic load
- Carb counting
- Insulin sensitivity/insulin resistance (SFA vs. MUFA)

**Cardiovascular health**
- Lipoprotein classes (beyond LDL-c and HDL-c)
- Oxidized lipoproteins
- Lipoprotein density

**Metabolic syndrome**
- Dietary fat

**Nutrient benefits**
- Antioxidants (chronic disease; mortality; beauty – skin health and aging)
- Phytonutrients (chronic disease, cancer)
- Carotenoids (type 2 diabetes, insulin sensitivity/insulin resistance, dietary sources, impacts on health, cognitive function)
- Polyphenols
- Dietary fat (metabolic syndrome)
- MUFA (visceral adiposity/abdominal fat; inflammation; blood pressure)
- Oleic acid (cognition)
- Short-chain fatty acids (appetite, inflammation, type 2 diabetes)
- Fiber (Inflammation; depression; diabetes/glycemic control/insulin sensitivity/insulin resistance/glycemic load; prebiotic fiber and gut health; blood pressure; acne)
- Vitamin K (cognition, insulin sensitivity, type 2 diabetes)
- Lutein (cancer, cognition)

**Foods and benefits**
- Avocado

**Therapeutic diets/dietary patterns**
- MIND diet (cognition)
- FODMAP (gut health; IBS; What are FODMAPS? Where are they found? Benefits?)
- Low carb diet (type 2 diabetes, ketosis, weight management)
- Low carb, high fat diet (fat mass, weight management)
- Vegetarian (glycemic control)
- Mediterranean (glycemic control/insulin sensitivity)

**Mental health**
- Depression (fruit and vegetable intake, fiber, insulin sensitivity)
- Quality of life measures

**Gut health**
- Microbiome
- Fiber & gut health

**Hispanic health disparity**

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