The National Academies of
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Nutrition During Pregnancy and Lactation: Exploring New Evidence - A Workshop

National Academies Sciences Building | 2101 Constitution Ave., NW | Lecture Room | Washington, DC 20418

WORKSHOP CONTEXT

The overarching charge to the 1989 National Academies' subcommittees on nutrition in pregnancy and lactation was "to evaluate and document the current scientific evidence and formulate recommendations for the nutritional needs of pregnant and lactating women." The lactation subcommittee was also asked to consider justification for special recommendations for different maternal age and ethnic groups. The pregnancy and lactation subcommittees released their respective reports and recommendations in 1990 (*Nutrition During Pregnancy*) and 1991 (*Nutrition During Lactation*).

In the intervening period since release of these two reports, there has been advances that warrant an exploration of the state of the science related to nutrition during pregnancy and lactation. Our understanding of nutrient requirements during these critical windows, for instance, has evolved over the past 30 years. Dietary patterns and nutritional supplement use have also changed, which have implications for dietary recommendations for women who are pregnant or lactating. A growing body of research provides evidence that maternal nutrition during these periods can have both short- and long-term health implications for mother and child.

There have also been changes in the population since the early 1990's. There has been a shift toward greater numbers of at-risk population groups, along with other socioeconomic changes. These shifts could influence the proportion of women who have access to adequate resources and information needed to choose a healthy diet. In addition, disparities in access to healthy foods as well as environments that support healthy lifestyle choices are of increasing concern. There has also been a shift toward delayed childbearing, so that more women are entering pregnancy for the first time in their early to late 40s. This population subgroup is at greater risk of having metabolic risk factors that may have an impact on pregnancy and lactation outcomes compared to younger women.

This two-day workshop will explore the state of the science today, relative to what was known and accepted three decades ago. The workshop will examine current evidence on nutrients, nutritional supplements, and other nutrition-based topics relevant to pregnancy and lactation. The workshop topics will also include discussion of equity in access to nutritional care for women of childbearing age.

AGENDA	
Wednesday, January 29, 2020	
7:30 AM ET	**Registration Opens**
8:00	**Setting the Stage for the Workshop** *Anna Maria Siega-Riz, University of Massachusetts at Amherst***
8:20	**Sponsor Remarks** *Nancy Potischman, National Institutes of Health* *Heather McMilllan, Health Canada* *Alison Steiber, Academy of Nutrition and Dietetics* (remote)
Session I: Macronutrient Requirements *Session Overview:* Women often ask about macronutrient requirements at their first antenatal visit, "*How many calories should I be eating?*" or *"What diet should I now follow?*" Many women are under the impression that they should eat for "two" during pregnancy. This mindset can be problematic, given the prevalence of overweight and obesity in the population. In contrast, some women may not be eating enough or limiting certain foods that contain nutrients of increased requirements during this critical window. This session will focus on current and emerging evidence on macronutrient requirements and quality to support optimal maternal health and fetal growth.	
8:35	**Session Overview** *Patrick Catalano, Tufts School of Medicine and Tufts Medical Center (Moderator)**
8:40	**Dietary Fat, Fatty Acids and the Specific Health Effects of Omega-3 Fatty Acids In Pregnancy and Lactation** *Maria Makrides, South Australian Health and Medical Research Institute* (remote)
9:05	**Discussion with Maria Makrides**
9:15	**Protein and Amino Acid Requirements in Pregnancy and Lactation: New Evidence Challenge Current Recommendations** *Rajavel Elango, The University of British Columbia and BC Children's Hospital*
9:40	**Carbohydrates and Energy Requirements** *Leanne Redman, Pennington Biomedical Research Center*
10:05	**Discussion**
10:25	**Break**
Session II: One-Carbon Metabolism Micronutrients *Session Overview:* Maternal micronutrients involved in one-carbon metabolism play an important role in both maternal health and fetal growth and development. Deficiencies in one-carbon chain metabolism micronutrients have been associated with adverse pregnancy outcomes, including congenital birth defects, fetal growth disorders, and preterm birth. Dietary intakes of one-carbon nutrients and use of supplements have changed over the last half century and the food supply is now fortified with folic acid. Available evidence suggests dietary intakes of vitamin B12 and choline may be inadequate and synthetic folic acid intakes might be too high in some sub-populations. This session will review these issues and explore the health impact of current recommendations with respect to potential misalignments of actual dietary and supplemental intakes.	
10:35	**Session Overview** *Tamera Hatfield, University of California Irvine Health (Moderator)**
10:40	**From Inadequacy to Possible Excess: Discrepancy in Folate and Vitamin B12 Status of Pregnant Women Across Population Groups and their Possible Implications on Child Outcomes** *Yvonne Lamers, The University of British Columbia*

11:05	**Choline Science Overview: Exploring the Growing Science on the Benefits of Choline for Mothers and Infants** *Marie Caudill, Cornell University*
11:30	**Discussion**
12:00 PM ET	**Break for Lunch** *Cafeteria is located on the basement level*

Session III: Iron, Vitamin D, Calcium, Antioxidants, and Iodine

Session Overview: The micronutrients to be discussed in this session are well established as essential nutrients with increased requirements during pregnancy and lactation. While iron, vitamin D, and calcium are routinely incorporated into standard prenatal supplement preparations, evidence over the past few decades calls into question the most appropriate doses. The addition of iodine to prenatal multivitamins and supplements is not mandatory in the United States, but there is concern that pregnant and lactating women may be iodine insufficient. Pro-inflammatory conditions increase pregnancy risks, and pregnancy itself is a relatively inflammatory state. Diet can influence inflammatory markers. The optimal antioxidant composition of diet and/or supplements is an area of active study. This session will explore the current state of the evidence on these nutrients.

1:00	**Session Overview** *Emily Oken, Harvard Medical School and Harvard Pilgrim Health Care Institute (Moderator)**
1:05	**Iron, Vitamin D and Calcium: New Evidence During Pregnancy and Lactation** *Kimberly O'Brien, Cornell University*
1:40	**Nutritional Antioxidants During Pregnancy and Lactation** *Corrine Hanson, University of Nebraska Medical Center*
2:05	**Iodine in Pregnancy and Lactation** *Elizabeth Pearce, Boston University School of Medicine*
2:30	**Discussion**
3:00	**Break**

Session IV: Nutritional Supplements

Session Overview: Over the past several decades, there have been substantial changes in the type and formulation of nutritional supplements for women during pregnancy and lactation. In the 1990s, there was an emphasis on prenatal vitamins and supplements to prevent having an intrauterine growth restricted fetus. Today, we now have a problem of some excess nutrients among those who have higher quality diets while others, with lower quality diets, are experiencing deficiencies despite high caloric intakes. It is currently well understood that there are specific nutritional needs during pregnancy and lactation that support and enhance the growth and development of the fetus, however there is large variation as to how these needs are optimally met given significant variation in dietary intakes in combination with available nutritional supplements. Given the wide variety of formulations in nutritional supplements (both prescription and non-prescription), this session will explore the role of optimal supplement use and bioavailability, with consideration of the patterns of use and necessity of supplements beyond the traditional prenatal vitamin.

3:20	**Session Overview** *Tamera Hatfield, University of California Irvine Health (Moderator)**
3:25	**Dietary Supplement Use and Its Micronutrient Contribution During Pregnancy and Lactation in the United States** *Regan Bailey, Purdue University*
3:50	**Prenatal Supplement Formulations** *Laura Borgelt, University of Colorado Anschutz Medical Campus*
4:15	**Discussion**

4:45	**Reflections on the Day** *Anna Maria Siega-Riz, University of Massachusetts at Amherst***
5:00	**Adjourn Day 1**

Thursday, January 30, 2020

7:30 AM ET	**Registration Opens**
8:00	**Summary of Day 1 and Overview of Day 2** *Anna Maria Siega-Riz, University of Massachusetts at Amherst***

Session V: New Developments and Emerging Topics

Session Overview: There has been an unprecedented amount of research conducted in the last decade concerning how nonnutritive factors associated with diet may impact maternal and fetal health during pregnancy, and maternal and infant health during lactation. In this session, select debated emerging topics will be discussed. An overview will be provided on our understanding of the potential risks associated with caffeine use during pregnancy and lactation, and more specifically increasingly popular energy drinks. The evidence for a microbiome in the placental compartment, the vagina, and maternal breastmilk will also be presented, as well as a description of how variation in maternal diet, use of probiotics, and mode delivery may affect the assemblage of these microbiomes. Finally, emerging evidence for associations between maternal metabolism and dietary composition as they may influence the content of both carbohydrates and bioactive compounds in breast milk, specifically fructose and human milk oligosaccharides. These topics will be discussed in the context of infant microbiome and body composition.

8:10	**Session Overview** *Deborah O'Connor, University of Toronto (Moderator)**
8:15	**Caffeine in Pregnancy and Lactation: What's New?** *Janet Thorlton, University of Illinois-Chicago College of Nursing*
8:40	**Maternal Diet During Pregnancy and Lactation and the Interaction with the (Developing) Infant Microbiome** *Kjersti Aagaard, Baylor College of Medicine*
9:05	**Fructose and Oligosaccharides in Human Breastmilk and Effects on Infant Body Composition and Cognitive Outcomes** *Michael Goran, Children's Hospital of Los Angeles and University of Southern California*
9:30	**Discussion**
10:00	**Break**

Session VI: Maternal Intakes and Nutritional Status During Lactation and Implications for Maternal and Infant Health

Session Overview: The body of evidence on the effects of maternal nutrition on breastmilk composition and infant health has improved dramatically in recent years. Evidence has also emerged showing that lactation may have lasting benefits on cardiometabolic health outcomes in women, which has implications for diabetes and cardiovascular disease prevention. These themes provide important implications to update nutritional recommendations during this time and to strengthen the evidence basis for prevention efforts. This session will provide an overview of scientific advances in our understanding of maternal nutritional status, nutrient supplementation, and metabolic health status as they influence breast milk composition, lactogenesis, and infant outcomes.

10:15	**Session Overview** *Deborah O'Connor, University of Toronto (Moderator)**
10:20	**Maternal Micronutrient Status and Intake: Effects on Human Milk Composition** *Lindsay Allen, U.S. Department of Agriculture*

10:45	**Implications of Maternal Weight and Metabolic Status for Lactation and Breastmilk Composition** *Ellen Demerath, University of Minnesota*
11:10	**Lactation and Future Risk of Cardiometabolic Diseases in Women** *Erica Gunderson, Kaiser Permanente Northern California***
11:35	**Discussion**
12:05	**Break for Lunch** *Cafeteria is located on the basement level*

Session VII: Maternal Nutrient Intake and Early Life Programming

Session Overview: Abundant animal and human evidence now exists that nutrition during pregnancy and lactation affects perinatal outcomes and longer-term health of the offspring. The mechanisms by which nutritional factors influence programming of growth and development from the prenatal through postnatal periods are emerging as complex interplay of systems. These systems involve the microbiome, metabolome, placental functions for nutrients transfer and metabolism, and epigenetic alterations of both the placenta and the offspring. This session will focus on evidence regarding mechanisms by which the range of typical intake of important macro- and micronutrients during pregnancy and lactation may program offspring chronic disease risks. Susceptible subpopulations predisposed to obesity and dysmetabolism later in life will be highlighted.

1:00	**Session Overview** *Emily Oken, Harvard Medical School and Harvard Pilgrim Health Care Institute (Moderator)**
1:05	**Role of the Placenta in Delivering Nutrients and in Developmental Programming** *Leslie Myatt, Oregon Health & Science University*
1:30	**Panel Discussion: Early Life Programming Associated with Maternal Intake During Pregnancy and Lactation** *Kjersti Aagaard, Baylor College of Medicine* *Michael Goran, Children's Hospital of Los Angeles and University of Southern California* *Leslie Myatt, Oregon Health & Science University*
1:55	**Questions from the Audience**
2:20	**Break**

Session VIII: The Role of Systems and Policies Providing Solutions to Nutrition Access and Equity in Pregnancy and Lactation

Session Overview: Any consideration of nutrition during pregnancy and lactation should include a discussion of the structural, social, and environmental contexts in which dietary decisions and behaviors are made. Although nutrition recommendations for pregnant and lactating women require an understanding of the relevant biological and physiological processes within this life stage, this session will focus specifically on understanding the social determinants of dietary intakes and the implications for individual, systems, and population-level interventions. Special consideration will be given to examining approaches that increase access and equity.

2:35	**Session Overview** *Angela Odoms-Young, University of Illinois at Chicago (Moderator)**
2:40	**Systems Changes for Improving Maternal Nutrition During Pregnancy and Lactation Among U.S. Women** *Rafael Pérez-Escamilla, Yale School of Public Health*
2:50	**Using Nutrition Science to Reduce Perinatal Health Disparities** *Kate Keenan, University of Chicago*
3:00	**Food Insecurity and Stress as Common Challenges to Optimal Nutrition During Pregnancy** *Barbara Laraia, University of California, Berkeley*

3:10	**How WIC Supports Pregnancy and Lactation** *Darlena Birch, National WIC Association*
3:20	**Panel Discussion** *Darlena Birch, National WIC Association* *Kate Keenan, University of Chicago* *Barbara Laraia, University of California, Berkeley* *Rafael Pérez-Escamilla, Yale School of Public Health*
3:40	**Questions from the Audience**
Session IX: Reflection on the Workshop *Session Overview:* This last session will provide an opportunity to reflect on the presentation and discussions that took place over the course of the two-day workshop. Major themes and key topic areas will be highlighted.	
4:00	**Reflection on the Workshop** *Patsy Brannon, Cornell University*
4:20	**Reflections from the Audience**
4:50	**Closing Remarks** *Anna Maria Siega-Riz, University of Massachusetts at Amherst***
5:00	**Adjourn Workshop**