

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

## 1. SURVEY INFORMATION

Dear Colleague,

[The Sackler Institute for Nutrition Science](#), at the New York Academy of Sciences is implementing a global initiative to formulate an agenda for nutrition science research, in collaboration with the World Health Organization (WHO) and as part of this initiative, we are conducting a web-based consultation to identify key research topics in nutrition science, in which we would like to have your participation.

This process will take between 20 - 30 minutes.

Three broad focus areas are considered:

- **1) Environmental and societal trends affecting food and nutrition among vulnerable groups.**
- **2) Unresolved issues of nutrition in the lifecycle.**
- **3) Delivery of nutrition intervention and operational gaps.**

We are soliciting your comments on "**UNRESOLVED ISSUES OF NUTRITION IN THE LIFECYCLE**".

The Sackler Institute has compiled a series of research topics based on the preliminary work of a multi-disciplinary group of experts. In order to minimize your time commitment while optimizing your participation, we strongly encourage you to focus on selected themes and gap areas, based on your area of expertise.

The identified research topics will be part of the nutrition science research agenda that will be formally submitted, with supporting documents and relevant background, to the World Health Organization and will assist the WHO's efforts in the fight against malnutrition.

The additional outputs from this consultation process include an evaluation of the evidence base of top ranking research topics. Insights from the evidence base review will inform a series of white papers around the more pressing research topics that will then be published in The Annals of the New York Academy of Sciences. These white papers will be promoted as tools to guide new research endeavors and funding. The Sackler Institute and the New York Academy of Sciences will actively mobilize their resources to encourage research funding agencies, policy makers, program implementers, donors, the research community and the private sector to integrate these needs in their decision making process.

We are looking forward to your participation,

This link allows you to download the [PDF list of research themes](#). Please download this document. We recommend that you review it now and keep it open for reference.

Please, remember that:

- Your identity will be kept confidential
- You may choose to skip questions. We do encourage you to focus on your topics of expertise.

Best Regards

Mandana Arabi, MD, PhD

Director, The Sackler Institute for Nutrition Science The New York Academy of Sciences,

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

With

The Sackler Institute for Nutrition Science's Advisory Group: Robert Black, Francesco Branca, Kathryn Dewey, Stuart Gillespie, Chizuru Nishida, David Pelletier, Werner Schultink, Andrew Serazin and Patrick Webb

And

The Unresolved Issues of Nutrition in the Lifecycle Working Group: Mandana Arabi, James Berkley, Robert Black, Zulfiqar Bhutta, Francesco Branca, Parul Christian, Kathryn Dewey, Patrice Engle, Susan Finn, Berthold Koletzko, Anna Larrey, Nabeeha M. Kazi, Chizuru Nishida, Helena Pachon, Daniel Raiten, Greg Reinhart, Rebecca J Stoltzfus, Ahmed Tahmeed, Emorn Wasantwisut

## 2. PERSONAL INFORMATION (will not be disclosed)

No names will be disclosed, this information will only help us track down the participation rate. Please indicate your e-mail and let us know if you wish to receive the consultation results. Your information will not be shared with external audiences or sold to any entities.

### \* 1. Full Name

### \* 2. Job Title

### \* 3. Institution

### 4. Secondary affiliation(s)

### \* 5. e-mail

### 6. Would you like to receive the survey results via e-mail?

yes

No

## 3. Theme 1) Pre-conception to Early Childhood (First 1000 days and Beyond)

[ACCESS THE PDF FILE HERE](#)

According to information from the WHO (2011), more than 13 million low-birth weight babies are born each year. These babies are often affected by severe short and long-term health and developmental consequences. Poor nutritional status and nutrient intake for women before, during and after pregnancy not only impact a woman's health status and productivity, but may also have detrimental effects on birth weight, nutritional status and early childhood development.

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Despite the critical role of maternal nutrition, few nutritional interventions for mothers have assessed a wide range of outcomes at sufficient scale.

Fetal and early postnatal life is a period of rapid growth and development and especially vulnerable to nutritional perturbations. Here, we have identified gaps in nutrition knowledge during the first thousand days from pregnancy through age two. This period provides a crucial window of opportunity for reducing malnutrition and its adverse effects.

An integrated systems biology approach is used to move towards understanding the influence of nutrition on the physiological balance of homeostasis during pregnancy and the physical growth and cognitive/motor/social-emotional development of the neonate.

## 7. Based on your review of the document, would you like to comment on this theme?

- Yes
- No

## 4. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)

Please answer the following questions about the first research theme: **Pre-conception to early childhood (first 1000 days and beyond).**

These questions concern **gaps in knowledge related to fundamental biology.**

### **8. Gap area 1: Understanding the role of nutrition in Developmental Origins of Health and Disease: please select in the list below ONE research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- What is the role of nutrition during fetal growth and development, including the role of maternal nutrition (particularly maternal obesity) and the maternal-fetal interface?
- What are the dietary requirements to support growth and optimize health during early life and later?
- What is the role of catch-up growth and rapid weight gain, and when can it be considered beneficial during early life?
- What are the mechanisms for and potential causes of stunting and malnutrition during early life? Research is especially needed to determine the influence of parental nutritional factors and the long-term effects of multi-generational nutrition/malnutrition.
- How does nutrition influence the development of metabolic systems (healthy "microbiome", immunity, etc)?

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**9. About the question you selected, does it accurately reflect an existing gap in the field?**

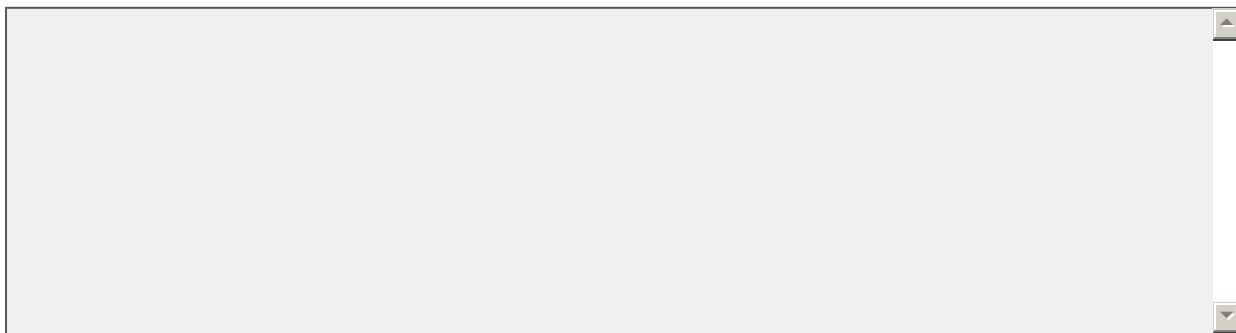
**Please explain.**

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide an explanation for their answer to question 9.

**10. Are you currently involved in any research that is addressing this question?**

- Yes
- No

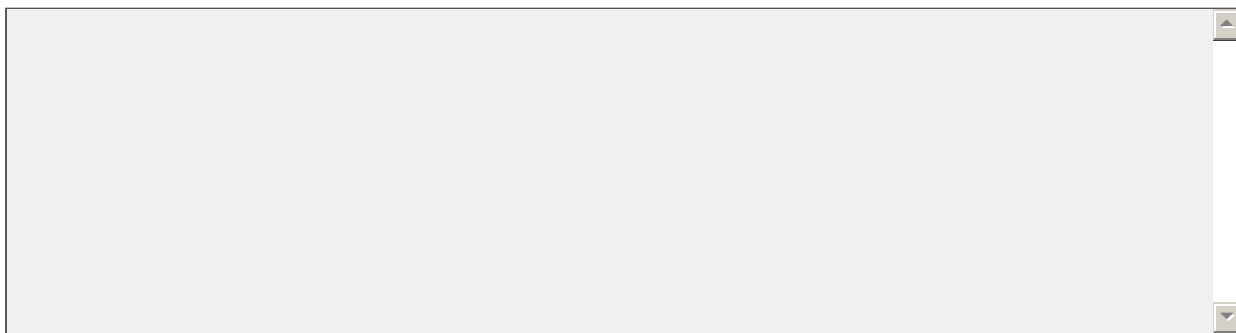
If yes, please provide details.

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide details if they answered 'Yes' to question 10.

**11. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide references if they answered 'Yes' to question 11.

**5. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Please now select a second research question in the list below.

**If you do not wish to select a second research question, please go straight to the NEXT button at the bottom of this page.**

**12. Gap area 1: Understanding the role of nutrition in Developmental Origins of Health and Disease: please select in the list below a **SECOND** research question which you feel should be dealt with in priority.**

- What is the role of nutrition during fetal growth and development, including the role of maternal nutrition (particularly maternal obesity) and the maternal-fetal interface?
- What are the dietary requirements to support growth and optimize health during early life and later?
- What is the role of catch-up growth and rapid weight gain, and when can it be considered beneficial during early life?
- What are the mechanisms for and potential causes of stunting and malnutrition during early life? Research is especially needed to determine the influence of parental nutritional factors and the long-term effects of multi-generational nutrition/malnutrition.
- How does nutrition influence the development of metabolic systems (healthy "microbiome", immunity, etc)?

**13. About the question you selected, does it accurately reflect an existing gap in the field? Please explain.**

**14. Are you currently involved in any research that is addressing this question?**

- Yes
- No


If yes, please provide details.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**15. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



### 6. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)

Please answer the following questions about the first research theme: **Pre-conception to early childhood (first 1000 days and beyond).**

These questions concern **gaps in knowledge related to fundamental biology.**

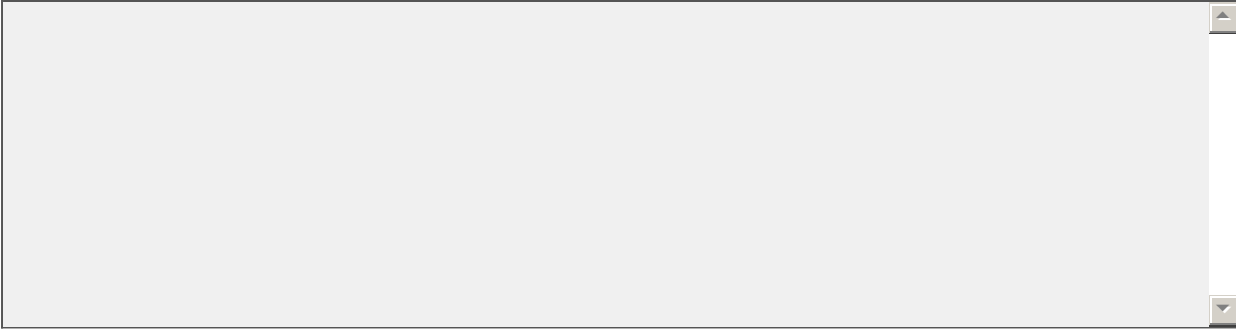
**16. Gap area 2: Characterizing normal growth during early life: please select in the list below **ONE** research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- What mechanisms are responsible for the normal flux of nutrients in utero between mother and infant? What are some appropriate markers that reflect functional changes consequent to that flux?
- How should adequate state-specific intake regulation for both the mother (during pre-conception, pregnancy, lactation and post-partum) and the child (in-utero, during neonatal life, infancy and early childhood) be determined?
- How should fetal malnutrition be characterized and assessed?
- Are current state-of-the art measurements for assessment of “normal” appropriate? This would include revisiting definitions and criteria for measuring and assessing childhood growth (growth standards, definitions for preterm, stunting, catch-up growth, moderate and severe acute malnutrition (SAM)).

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**17. About the question you selected, does it accurately reflect an existing gap in the field?**

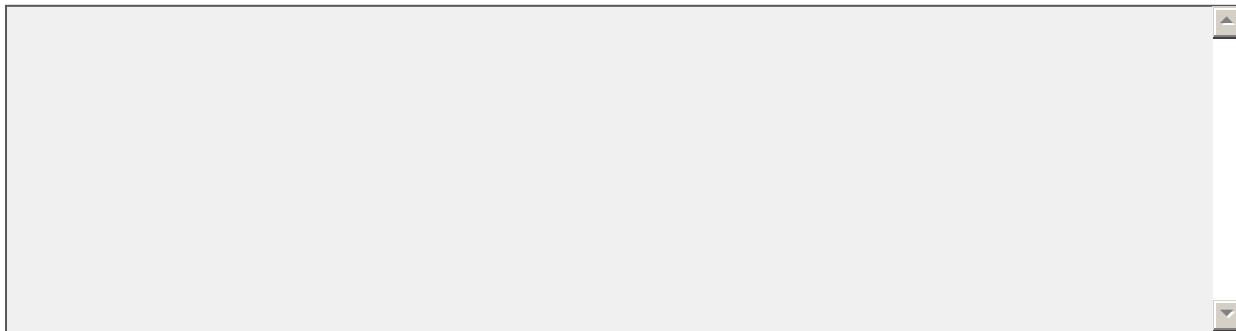
**Please explain.**



**18. Are you currently involved in any research that is addressing this question?**

- Yes
- No

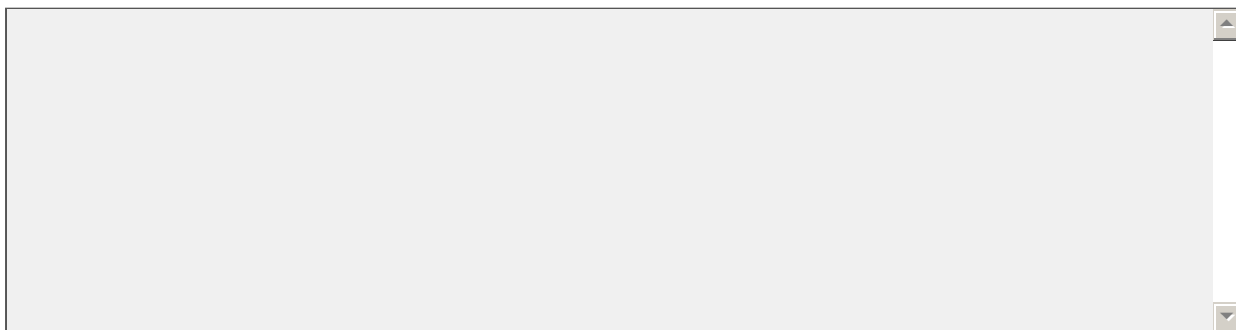
If yes, please provide details.



**19. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



**7. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Please now select a second research question in the list below.

**If you do not wish to select a second research question, please go straight to the NEXT button at the bottom of this page.**

## **20. Gap area 2: Characterizing normal growth during early life: please select in the list below a **SECOND** research question which you feel should be dealt with in priority.**

- What mechanisms are responsible for the normal flux of nutrients in utero between mother and infant? What are some appropriate markers that reflect functional changes consequent to that flux?
- How should adequate state-specific intake regulation for both the mother (during pre-conception, pregnancy, lactation and post-partum) and the child (in-utero, during neonatal life, infancy and early childhood) be determined?
- How should fetal malnutrition be characterized and assessed?
- Are current state-of-the art measurements for assessment of "normal" appropriate? This would include a revisiting of definitions and criteria for measuring and assessing childhood growth (growth standards, definitions for preterm, stunting, catch-up growth, moderate and severe acute malnutrition (SAM)).

## **21. About the question you selected, does it accurately reflect an existing gap in the field? Please explain.**

## **22. Are you currently involved in any research that is addressing this question?**

- Yes
- No

If yes, please provide details.




## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**23. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



### 8. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)

Please answer the following questions about the first research theme: **Pre-conception to early childhood (first 1000 days and beyond).**

These questions concern **gaps in knowledge related to fundamental biology.**

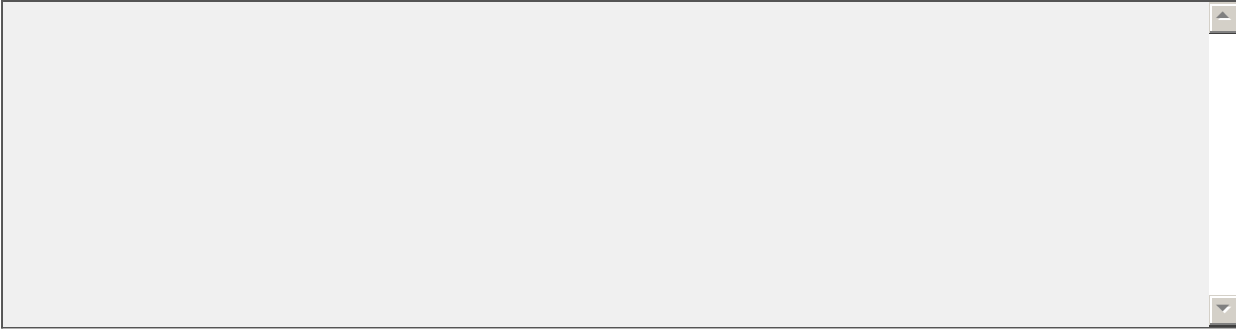
**24. Gap area 3: Characterizing and assessing optimal growth and development during early life: please select in the list below **ONE** research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- How can the contribution of optimal nutrition to growth and cognitive/physical development be separated and measured?
- Do appropriate developmental markers (subjective and functional) exist to assess "normal" child development? More specifically, can enhancement of function be detected within a normal range (subtleties in cognition/behavior beyond gross deficits)?
- How can we predict the optimal timing for nutrition interventions if we do not know how, when and for how long this should be addressed? Particular gaps include recommendations for treatment and prevention of SAM (Severe Acute Malnutrition) during 0-6 months.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**25. About the question you selected, does it accurately reflect an existing gap in the field?**

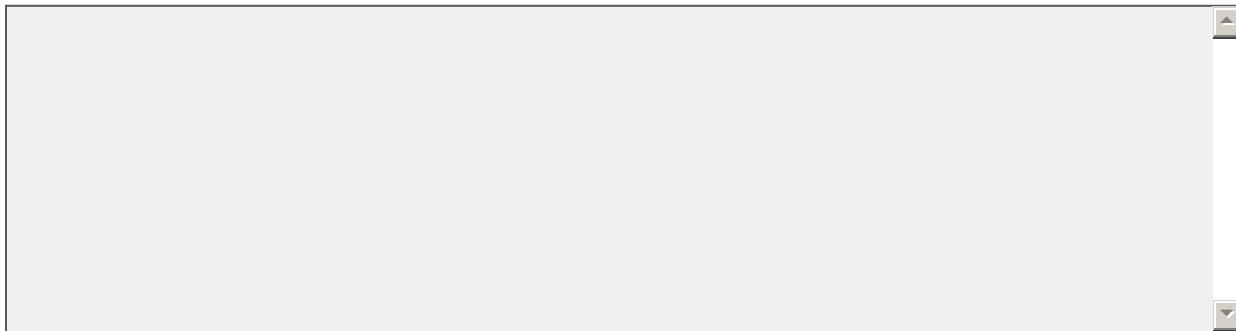
**Please explain.**



**26. Are you currently involved in any research that is addressing this question?**

- Yes
- No

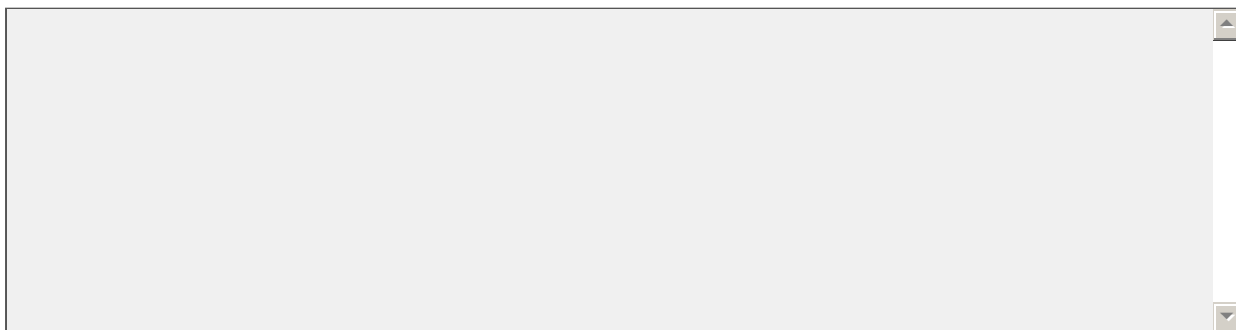
If yes, please provide details.



**27. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



**9. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Please now select a second research question in the list below.

**If you do not wish to select a second research question, please go straight to the NEXT button at the bottom of this page.**

**28. Gap area 3: Characterizing and assessing optimal growth and development during early life: please select in the list below a **SECOND** research question which you feel should be dealt with in priority.**

- How can the contribution of optimal nutrition to growth and cognitive/physical development be separated and measured?
- Do appropriate developmental markers (subjective and functional) exist to assess "normal" child development? More specifically, can enhancement of function be detected within a normal range (subtleties in cognition/behavior beyond gross deficits)?
- How can we predict the optimal timing for nutrition interventions if we do not know how, when and for how long this should be addressed? Particular gaps include recommendations for treatment and prevention of SAM (Severe Acute Malnutrition) during 0-6 months.

**29. About the question you selected, does it accurately reflect an existing gap in the field?  
Please explain.**

**30. Are you currently involved in any research that is addressing this question?**

- Yes
- No


If yes, please provide details.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**31. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



### 10. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)

Please answer the following questions about the first research theme: **Pre-conception to early childhood (first 1000 days and beyond).**

These questions concern **gaps in knowledge related to contextual factors.**

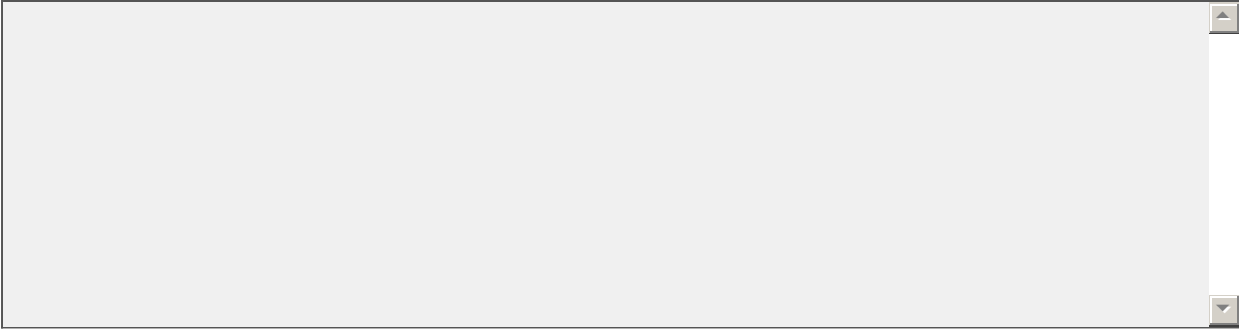
**32. Gap area 4: Describing and understanding contextual factors in relation to the period running from pre-conception to early childhood: please select in the list below **ONE** research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- What are the risk factors and causes of adverse birth outcomes (Pre-term Birth, Low Birth Weight (LBW), and Small for Gestational Age (SGA)) and how are they related to maternal nutrition, health, and the environment?
- What is the relationship between maternal nutrition, maternal mental health, maternal empowerment, and their combined effects on care-giving? Related to this, how can maternal “empowerment” be better defined and measured related to maternal and child health, nutrition and development outcomes?
- Have current nutrition requirements been adapted appropriately for vulnerable populations (e.g. for pre-term infants, specific disease states, and orphaned infants/children)? If not, what type of research can provide evidence for development of better recommendations?

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**33. About the question you selected, does it accurately reflect an existing gap in the field?**

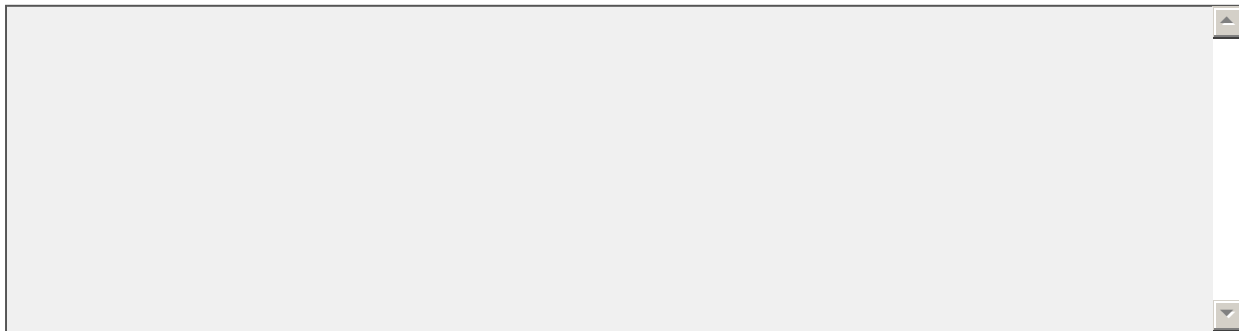
**Please explain.**

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**34. Are you currently involved in any research that is addressing this question?**

- Yes
- No

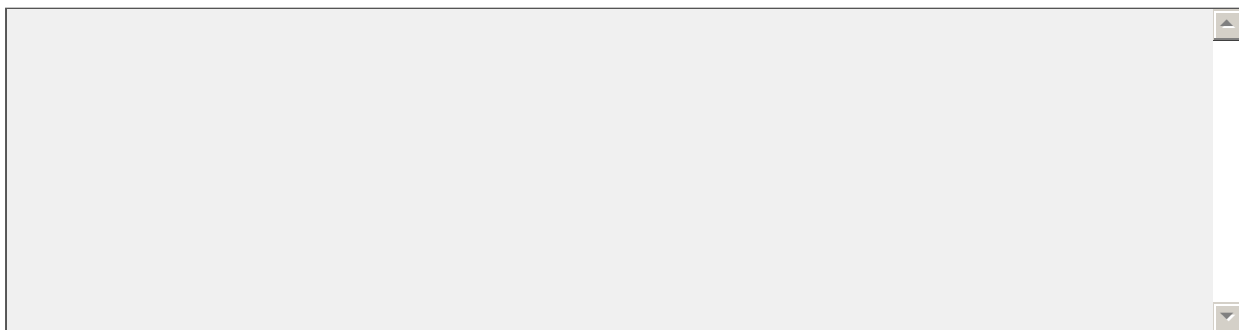
If yes, please provide details.

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide details if they are currently involved in research addressing the question.

**35. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide reference(s) if they have knowledge of existing or emerging research.

**11. Theme 1) Pre-conception to early childhood (first 1000 days and beyond)**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Please now select a second research question in the list below.

**If you do not wish to select a second research question, please go straight to the NEXT button at the bottom of this page.**

**36. Gap area 4: Describing and understanding contextual factors related to the period running from pre-conception to early childhood: please select in the list below **A SECOND** research topic which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- What are the risk factors and causes of adverse birth outcomes (Pre-term Birth, Low Birth Weight (LBW), and Small for Gestational Age (SGA)) and how are they related to maternal nutrition, health, and the environment?
- What is the relationship between maternal nutrition, maternal mental health, maternal empowerment, and their combined effects on care-giving? Related to this, how can maternal "empowerment" be better defined and measured related to maternal and child health, nutrition and development outcomes?
- Have current nutrition requirements been adapted appropriately for vulnerable populations (e.g. for pre-term infants, specific disease states, and orphaned infants/children)? If not, what type of research can provide evidence for development of better recommendations?

**37. About the question you selected, does it accurately reflect an existing gap in the field?  
Please explain.**

**38. Are you currently involved in any research that is addressing this question?**

- Yes
- No


If yes, please provide details.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**39. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



## 12. Theme 2) Moving from single nutrients to a systems biology food-based appr...

[ACCESS THE PDF FILE HERE](#)

Traditionally, human nutrition research has largely focused on evaluating one nutrient at a time. Demonstrating the health impact of nutrients such as Vitamin A, folic acid, iron and iodine has helped shape nutrition interventions and policy in both developing and developed countries. While it is critical to understand the role of these individual nutrients in improving health outcomes, there is also a need to use a more comprehensive approach that examines the effects of whole foods, suites of nutrients, and entire diets to complement our current scientific knowledge on single nutrients or isolated compounds.

Food -based, systems biology approaches can be effective tools to address the full spectrum of malnutrition in populations globally. Using an integrated view of food systems and human metabolism will help our understanding of how foods interact with the human biological system. This approach considers entire suites of essential nutrients and other components in food that together have an influence on functional outcomes, including immune function, reproductive health, cognitive development, adult chronic disease and others.

A food-based approach can also help identify strategies to improve functional outcomes during critical phases of human development, in particular pregnancy and early childhood. This type of approach can improve the general quality of the diet (for example, by increasing fruit, vegetable and animal product intake), while providing additional benefits by reducing consumption of less nutritious carbohydrates and fats, and increasing other micronutrients such as essential fatty acids and phytonutrients. This strategy is consistent with the need to lower the global risk of chronic disease and overweight that is exacerbated by consumption of poor quality diets.

**40. Based on your review of the document, would you like to address the issues raised in theme 2?**

- Yes
- No

## 13. Theme 2) Moving from single nutrients to a systems biology food-based approach...

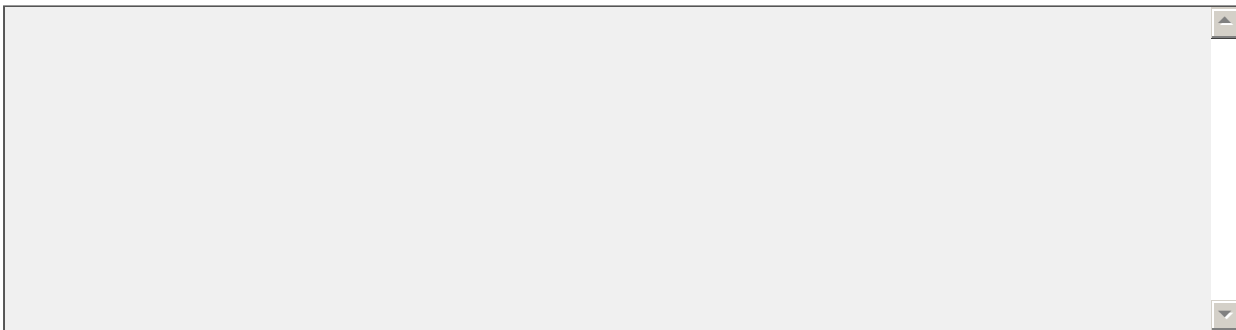
Please answer the following questions about the first research theme: **Moving from single nutrients to a systems biology food-based approach.**

These questions concern **gaps in knowledge related to fundamental biology.**

**41. Gap area 5: Creating a food-based systems biology of nutrition and human health in mother and child : please select in the list below ONE research question or topic which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- Understanding bioavailability of nutrients and micronutrients in whole foods (most importantly: human milk, animal products, and staple foods).
- Research on suites of nutrients including fatty acids in developing countries, nutrients associated with growth (phosphorus, potassium, magnesium), and some B vitamins (choline).
- How can food-based dietary guidelines be better linked to effects on human biology? Research is needed on integrating knowledge on molecular mechanisms, human metabolism, nutrition requirements and behavior to further nutrient-based recommendations and develop food-based dietary guidelines for the entire life course.
- Can food-based approaches improve micronutrient status and do they require complementary interventions to ensure adequate intake?
- Developing food-based interventions to modify diet quality and diversity and address the double burden of malnutrition

**42. About the question you selected, does it accurately reflect an existing gap in the field? Please explain.**





## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

### 43. Are you currently involved in any research that is addressing this question?

Yes

No

If yes, please provide details.

### 44. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?

Yes

No

Please, provide reference(s)

## 14. Theme 2) Moving from single nutrients to a systems biology food-based approach...

Please now select a second research question in the list below.

**If you do not wish to select a second research question, please go straight to the NEXT button at the bottom of this page.**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**45. Gap area 5: Creating a food-based systems biology of nutrition and human health in mother and child: please select in the list below a **SECOND** research question or topic which you feel should be dealt with in priority.**

- Understanding bioavailability of nutrients and micronutrients in whole foods (most importantly: human milk, animal products, and staple foods).
- Research on suites of nutrients including fatty acids in developing countries, nutrients associated with growth (phosphorus, potassium, magnesium), and some B vitamins (choline).
- How can food-based dietary guidelines be better linked to effects on human biology? Research is needed on integrating knowledge on molecular mechanisms, human metabolism, nutrition requirements and behavior to further nutrient-based recommendations and develop food-based dietary guidelines for the entire life course.
- Can food-based approaches improve micronutrient status and do they require complementary interventions to ensure adequate intake?
- Developing food-based interventions to modify diet quality and diversity and address the double burden of malnutrition

**46. About the question you selected, does it accurately reflect an existing gap in the field?  
Please explain.**

**47. Are you currently involved in any research that is addressing this question?**

- Yes
- No

If yes, please provide details.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**48. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



## 15. Theme 2) Moving from single nutrients to a systems biology food-based approach...

Please answer the following questions about the first research theme: **Moving from single nutrients to a systems biology food-based approach.**

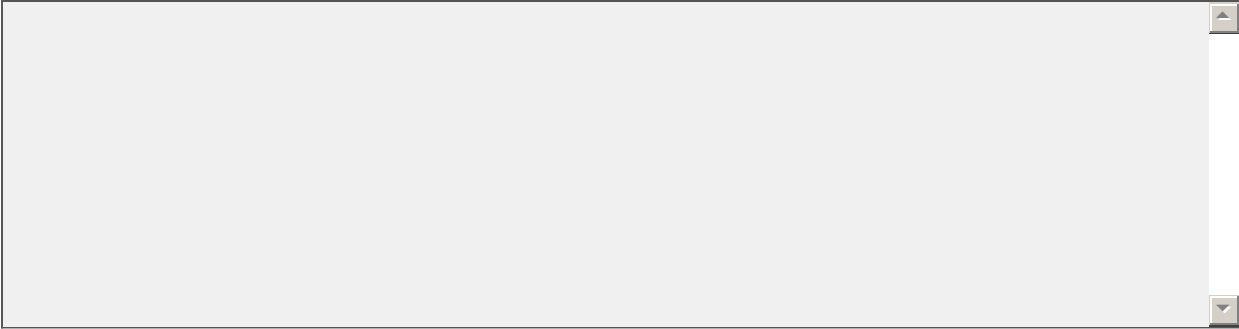
These questions concern **gaps in knowledge related to contextual factors.**

**49. Gap area 6: Describing and understanding contextual factors : please select in the list below ONE research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- How to describe and understand biomarkers to reflect exposure, status and functions (individuals and population across the lifecycle), and biomarkers for evaluating response to food-based interventions, biofortification, and other dietary interventions?
- How to understand genetic variation among individuals and populations related to nutritional status and nutrient adequacy/deficiency?
- How to develop the entire food system to meet the health needs of the population, from food production and agriculture to consumers and issues affecting availability and access of food products, including economics of food choice? Can food systems realistically support healthy diets for the whole population?

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

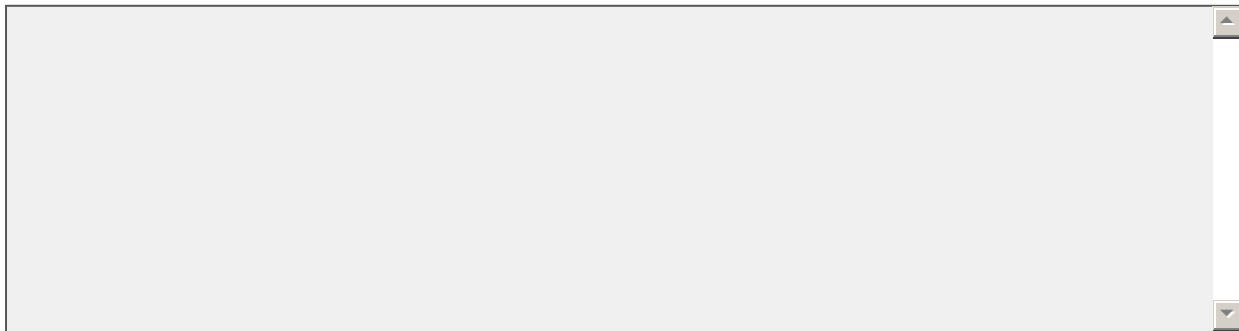
**50. About the question you selected, does it accurately reflect an existing gap in the field?  
Please explain.**



**51. Are you currently involved in any research that is addressing this question?**

- Yes
- No

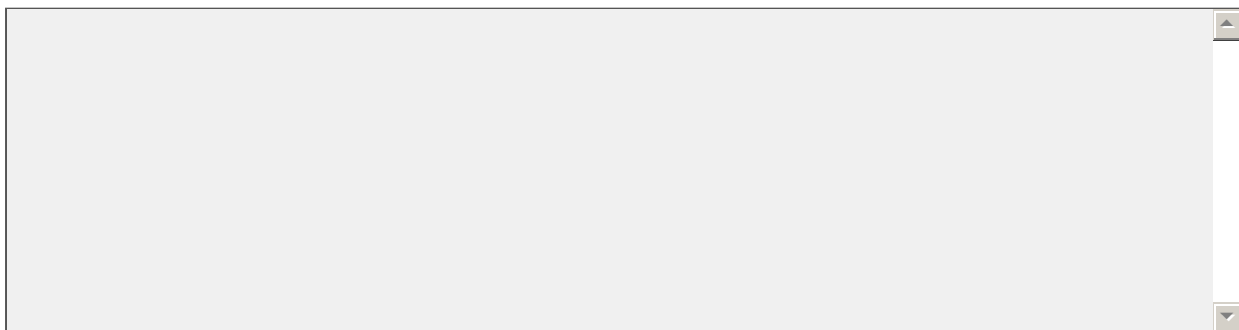
If yes, please provide details.



**52. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



**16. Theme 2) Moving from single nutrients to a systems biology food-based appro...**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Please now select a second research question in the list below.

**If you do not wish to select a second research question, please go straight to the NEXT button at the bottom of this page.**

**53. Gap area 6: Describing and understanding contextual factors : please select in the list below a **SECOND** research question which you feel should be dealt with in priority.**

- How to describe and understand biomarkers to reflect exposure, status and functions (individuals and population across the lifecycle), and biomarkers for evaluating response to food-based interventions, biofortification, and other dietary interventions?
- How to understand genetic variation among individuals and populations related to nutritional status and nutrient adequacy/deficiency?
- How to develop the entire food system to meet the health needs of the population, from food production and agriculture to consumers and issues affecting availability and access of food products, including economics of food choice? Can food systems realistically support healthy diets for the whole population?

**54. About the question you selected, does it accurately reflect an existing gap in the field?**

**Please explain.**

**55. Are you currently involved in any research that is addressing this question?**

- Yes
- No


If yes, please provide details.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**56. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



### 17. Theme 3) Malnutrition, infection, developmental & functional outcomes

[ACCESS THE PDF FILE HERE](#)

Promising interventions have targeted maternal macronutrient and micronutrient intake (The Lancet 2008), but research is needed to better assess long-term impacts on maternal and child health. Trials examining multiple micronutrients have yielded inconclusive results. Some findings indicate that there may be combined effects of food and multiple micronutrient supplementations on growth and development of the offspring. Additionally, information on the optimal timing of food supplementation to malnourished pregnant women and complementary feeding during infancy is lacking.

Frequent illness can impair nutritional status as energy and essential nutrients are diverted away from growth and conversely poor nutrition can increase the risk of infection. Infections are common in the first two years of life and an integrated view of human metabolism and diet/food systems is critical to understanding the influence of nutrition on the balance of homeostasis during health and wellness. As we begin to understand the immune response and the intestinal microbiota, the pathways through which an infection may modify the impact of nutrition interventions on child growth or mechanisms through which improved nutrition may reduce the impact of infection on child growth remain unclear.

Collectively, there is a need to better understand the impact of infection & sub-clinical conditions on nutrition and child growth/development (including birth outcome), and the interactions between nutrition, infection, and non-communicable diseases (NCDs).

**57. Based on your review of the document, would you like to address the issues raised in theme 3?**

- Yes
- No

### 18. Theme 3) Malnutrition, infection, developmental and functional outcomes

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Please answer the following questions about the third research theme: **Malnutrition, infection, developmental and functional outcomes and their interaction with nutrition interventions.**

These questions concern **gaps in knowledge related to fundamental biology.**

**58. Gap area 7: The relationship between markers of malnutrition (e.g. stunting in children, low height or BMI in women) and functional outcomes: please select in the list below **ONE** research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- How do nutrition and infection interact to influence the process of stunting in both mothers and children and what are the molecular mechanisms responsible for it?
- What are the effects of environmental enteropathy and malabsorption on nutritional interventions and early growth/development?
- Nutrition/pharmacology: How do exposure to toxins in the environment and drugs of abuse interact with malnutrition? What is the impact of scaling up preventive treatments for control of infections in malnourished individuals/populations, or those at risk of becoming malnourished?

**59. About the question you selected, does it accurately reflect an existing gap in the field?  
Please explain.**

**60. Are you currently involved in any research that is addressing this question?**

- Yes
- No


If yes, please provide details.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**61. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



### 19. Theme 3) Malnutrition, infection, developmental and functional outcomes

Please now select a second research question in the list below.

**If you do not wish to select a second research question, please go straight to the NEXT button at the bottom of this page.**

**62. Gap area 7: Relationship between markers of malnutrition (e.g. stunting in children, low height or BMI in women) and functional outcomes: please select in the list below a SECOND research question which you feel should be dealt with in priority.**

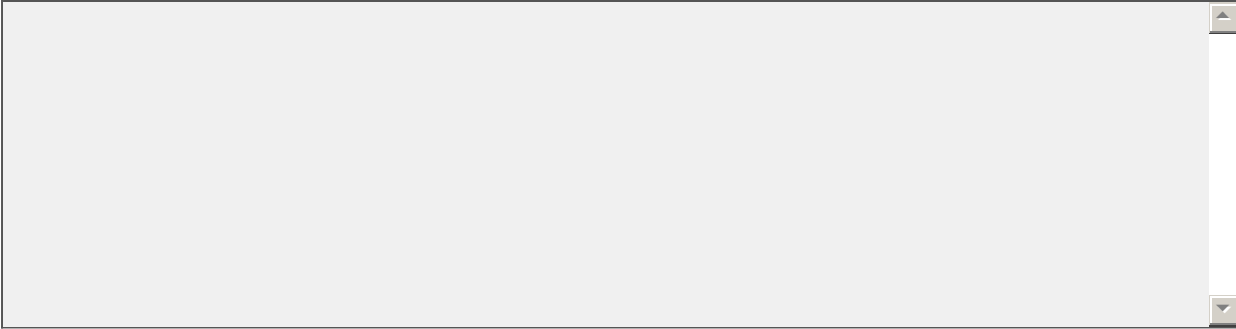
- How do nutrition and infection interact to influence the process of stunting in both mothers and children and what are the molecular mechanisms responsible for it?
- What are the effects of environmental enteropathy and malabsorption on nutritional interventions and early growth/development?
- Nutrition/pharmacology: How do exposure to toxins in the environment and drugs of abuse interact with malnutrition? What is the impact of scaling up preventive treatments for control of infections in malnourished individuals/populations, or those at risk of becoming malnourished?



## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**63. About the question you selected, does it accurately reflect an existing gap in the field?**

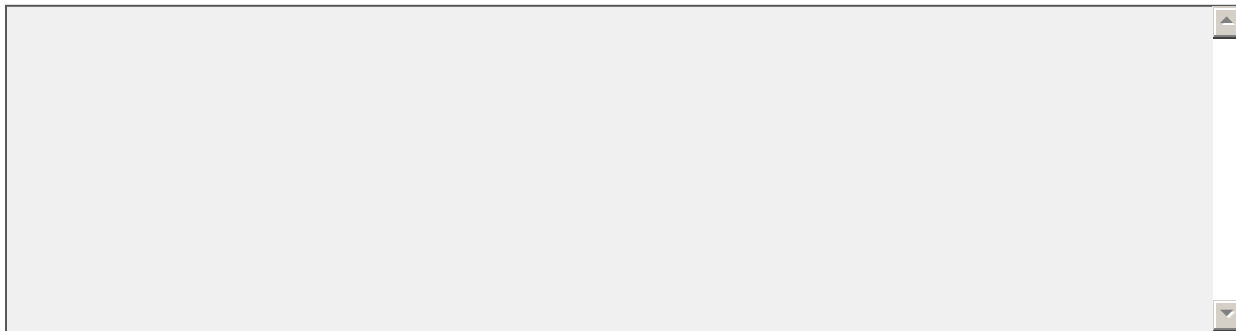
**Please explain.**

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide an explanation for their answer to question 63.

**64. Are you currently involved in any research that is addressing this question?**

- Yes
- No

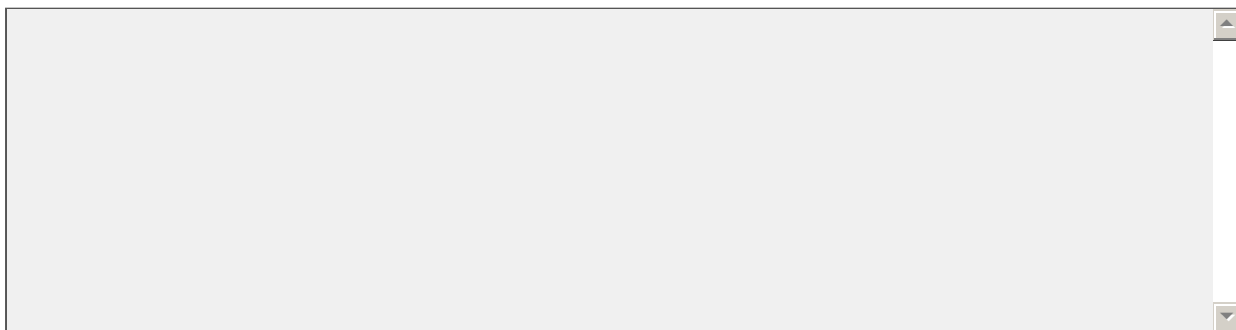
If yes, please provide details.

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide details if they answered 'Yes' to question 64.

**65. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide references if they answered 'Yes' to question 65.

**20. Theme 3) Malnutrition, infection, developmental and functional outcomes**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Please answer the following questions about the third research theme: **Malnutrition, infection, developmental and functional outcomes and their interaction with nutrition interventions.**

These questions concern **gaps in knowledge related to contextual factors.**

**66. Gap area 8: Describing and understanding contextual factors related to malnutrition, infection, developmental and functional outcomes: please select in the list below ONE research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions.**

- Definition of what aspects of 'context' are most salient to describe and understand relative to health, wellness and nutrition.
- How to develop our understanding of genetic variation among individuals and populations related to nutrition and response to illness (ex. microbiome reaction/development during infection, infection during pregnancy).

**67. About the question you selected, does it accurately reflect an existing gap in the field? Please explain.**

**68. Are you currently involved in any research that is addressing this question?**

- Yes
- No

If yes, please provide details.

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**69. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



### 21. Theme 4) Methodological challenges related to these research gaps

[ACCESS THE PDF FILE HERE](#)

The benefits of food-based approaches may include nutritional improvement, food security, cost-effectiveness, sustainability, and human productivity. At the same time, nutrition science is also influenced by economic and environmental policies and these approaches pose their own challenges, requiring additional inputs, including nutrition education and behavior change, and strong inter-sectoral linkages with agricultural planning to supply populations with diets to meet desired health goals. Potential obstacles to studying or addressing the above research themes related to maternal and child health are outlined below.

**70. Based on your review of the document, would you like to address the issues raised in theme 4?**

- Yes
- No

### 22. Theme 4) Methodological challenges related to these research gaps

Please answer the following questions about the fourth research theme: **Methodological challenges related to these research gaps.**

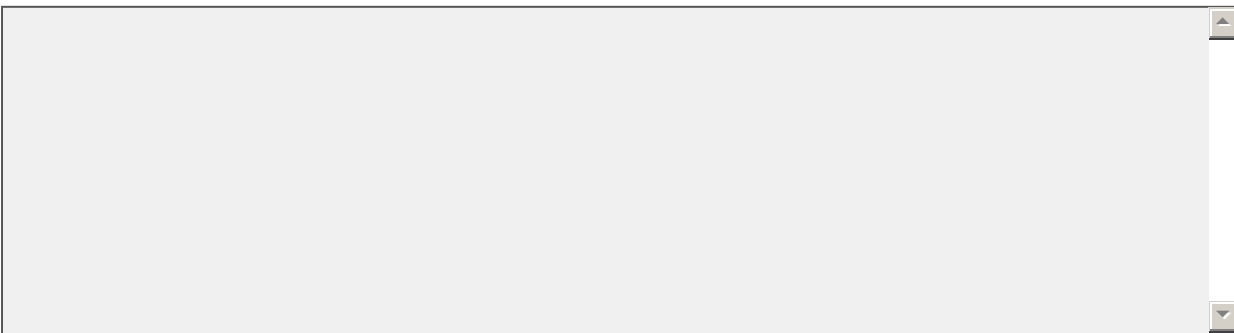
These questions concern the need to better **understand and drive basic science related to nutrition in the lifecycle.**

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**71. Gap area 9: Understanding and driving basic science related to nutrition in the lifecycle : please select in the list below ONE research question which you feel should be dealt with in priority taking into account both the existing knowledge base and the potential impact on nutrition interventions (you will be able to select a second topic later in the survey).**

- How to integrate mechanisms of action studies and biomedical models prior to clinical interventions and preventative treatments (development and emergency settings).
- How to test the effects of combining nutrition with early stimulation (in a broad sense), and determine appropriate indicators/measures of success?
- How to determine criteria and types of evidence needed to evaluate and interpret the impact of economic growth (especially for the dual burden of malnutrition and nutrition transition) and other contextual parameters?
- How to deal with unexpected heterogeneity in studies involving various population groups?

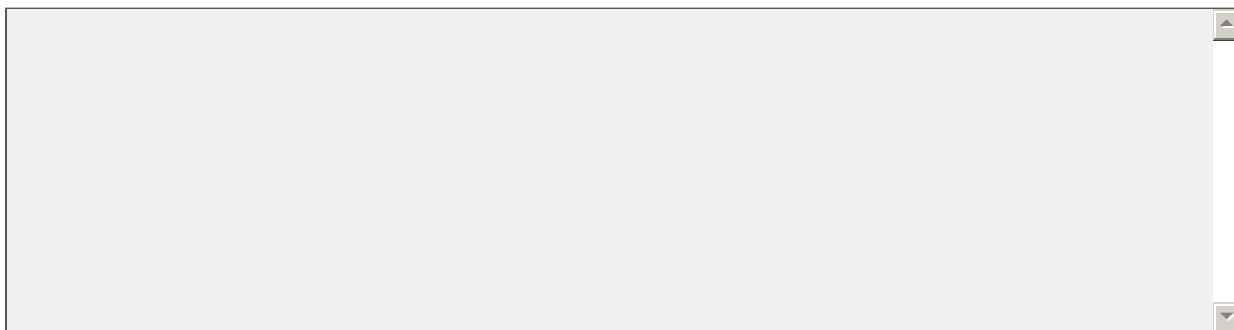
**72. About the question you selected, does it accurately reflect an existing gap in the field?  
Please explain.**



**73. Are you currently involved in any research that is addressing this question?**

- Yes
- No

If yes, please provide details.




## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**74. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)



### 23. Theme 4) Methodological challenges related to these research gaps

Please now select a second research question in the list below.

**If you do not wish to select a second research question please go straight to the NEXT button at the bottom of this page.**

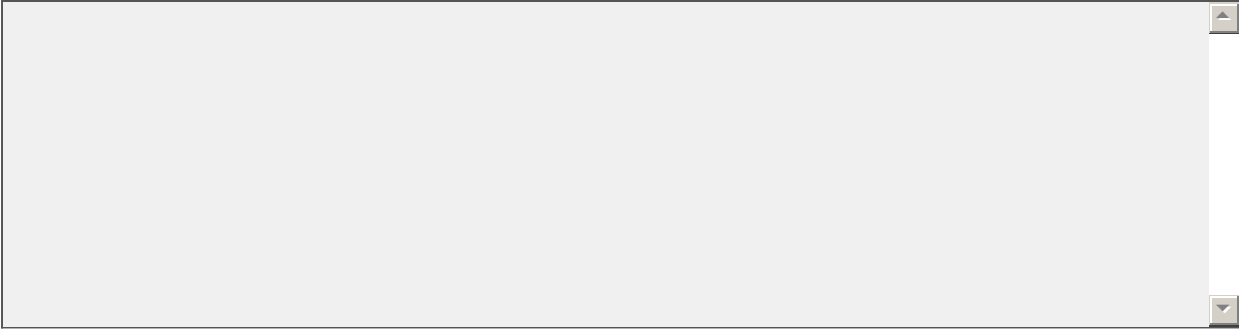
**75. Gap area 9: Understanding and driving basic science related to nutrition in the lifecycle : please select in the list below a **SECOND** research question which you feel should be dealt with in priority.**

- How to integrate mechanisms of action studies and biomedical models prior to clinical interventions and preventative treatments (development and emergency settings).
- How to test the effects of combining nutrition with early stimulation (in a broad sense), and determine appropriate indicators/measures of success?
- How to determine criteria and types of evidence needed to evaluate and interpret the impact of economic growth (especially for the dual burden of malnutrition and nutrition transition) and other contextual parameters?
- How to deal with unexpected heterogeneity in studies involving various population groups?

## RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

**76. About the question you selected, does it accurately reflect an existing gap in the field?**

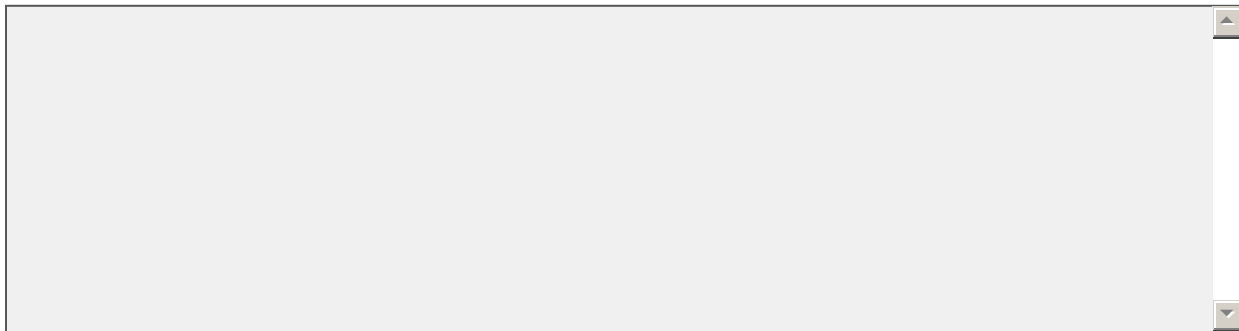
**Please explain.**

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide an explanation for their answer to question 76.

**77. Are you currently involved in any research that is addressing this question?**

- Yes
- No

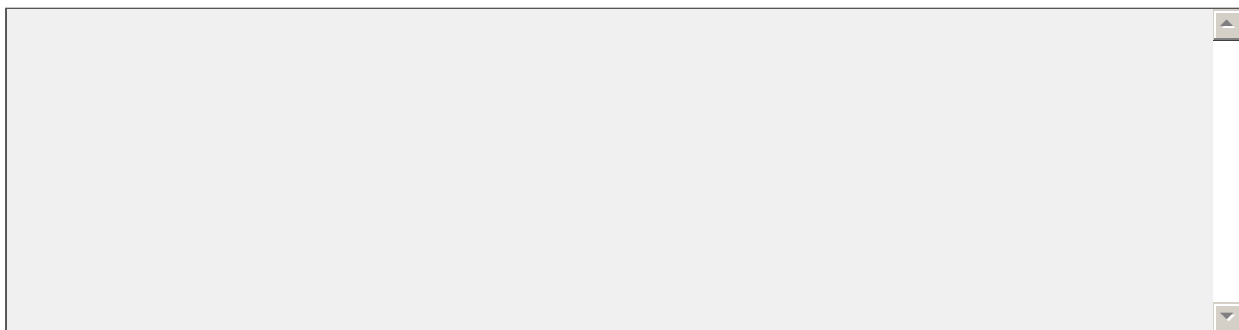
If yes, please provide details.

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide details if they answered 'Yes' to question 77.

**78. Do you have any knowledge of existing or emerging research that may already address this question—either partially or fully?**

- Yes
- No

Please, provide reference(s)

A large, empty text input field with a vertical scrollbar on the right side, intended for the respondent to provide references if they answered 'Yes' to question 78.

## 24. SURVEY CONCLUSION

# RESEARCH GAP CONSULTATION - Unresolved issues of Nutrition in the

Through this survey, you have reviewed around 30 research questions and topics categorized in gap areas and main themes.

Now that you are familiar with the survey, we would like you to conclude by providing your own assessment of the **three most important research gap areas** which you think should be tackled in priority.

## 79. Please identify in the list below the three research gap areas where you think research is most needed.

	1st priority	2nd priority	3rd priority
Gap area 1: Role of nutrition in Developmental Origins of Health and Disease (DOHaD)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 2: Characterizing normal growth during early life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 3: Characterizing and assessing optimal growth and development during early life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 4: Gaps in knowledge related to describing and understanding contextals related to the period running from pre-conception to early childhood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 5: Creating a food-based systems biology of nutrition and human health in mother and child	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 6: Gaps in knowledge related to describing and understanding contextual factors using a food-based systems biology of nutrition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 7: The relationship between markers of malnutrition (e.g. stunting in children, low height or BMI in women) and functional outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 8: Gaps in knowledge related to describing and understanding contextual factors in connection with malnutrition, infection, developmental and functional outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gap area 9: Methodological issues related to understanding and driving basic science related to the systems biology approach of nutrition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>