NUT 325: Science based interventions for child malnutrition
Tufts University
Friedman School of Nutrition Science and Policy
FALL 2016

Time and location of the course
Mondays, 1:30-4:30pm, Jaharis 156

Instructors
Irwin Rosenberg, M.D. | irwin.rosenberg@tufts.edu | 617.636.3701 |
Office Hours: To be determined

Shibani Ghosh, Ph.D. | shibani.ghosh@tufts.edu | 617.636.3771 | Skype: shibanighosh1
Office Hours: To be determined

Teaching Assistant
Krista Zillmer
Office Hours: By appointment

Tufts Graduate Credit: 1 credit
Prerequisites for taking this course: Not applicable

Course Description:
This course aims at bringing together the current knowledge and evidence in nutrition science and applied nutrition as it translates into policy recommendations and program interventions for prevention and treatment of child malnutrition (wasting and stunting) in developing countries. The course will provide an overview of the global evidence and recommendations on macro and micronutrients viz-a-viz interventions relating it to non-nutrition factors linked to wasting and stunting (e.g. environmental enteropathy, immunity and infection). Emphasis will be placed on understanding the concepts of micronutrients (Vitamin A, iron, folate, zinc and Vitamin B12) and macronutrient quality (e.g. essential amino acids and fatty acids). Case studies focusing on current ongoing activities, initiatives and programs will be reviewed/presented.

Course Objectives:
By the end of the course, students will:

1. Learn to analyze current global evidence on the role of macro and micronutrients in the prevention and treatment of wasting and stunting
2. Link the science around essential macro and micro nutrients (protein, energy, vitamin A, iron, zinc and folate) to programmatic responses on prevention and treatment
**Description of assignments, tests, and other required activities:**
The students will be required to select one topic (associated with a class), review and do research on that topic, presenting in class during the session that the particular topic is covered. Students will be required to make a 20-minute presentation using visual tools such as PowerPoint. The instructors will review the process of selecting a topic in the first class. All students will then use the information (and feedback from the presentation) to develop their term papers (due at the end of the class). Class participation will also be evaluated.

The following guidelines are used in evaluating course performance:
- Presentations and term papers will be evaluated on the basis of completeness, originality, scientific soundness and relevance to the assigned topic.
- Participation will be evaluated on presence and active interaction in the discussion of the particular class.

**Summary of Assignments and Grading**

<table>
<thead>
<tr>
<th>Assignment(s)</th>
<th>Grading Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>In class presentation</td>
<td>33%</td>
</tr>
<tr>
<td>Term paper</td>
<td>33%</td>
</tr>
<tr>
<td>Class participation</td>
<td>33%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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</tbody>
</table>

**Penalties for late or incomplete assignments:** This will be determined on the discretion of the instructors and based on usually applied practices at the Friedman School.

**Course texts and Materials** (for the course as a whole): No textbook required. Instructors have specific readings for each class that are listed in the subsequent sections.

**Academic Conduct**
Academic integrity, including avoiding plagiarism, is critically important. Each student is responsible for being familiar with the standards and policies outlined in the Friedman School’s *Policies and Procedures* manual (http://nutrition.tufts.edu/student/documents). It is the responsibility of the student to be aware of, and comply with, these policies and standards. In accordance with Tufts University’s policy on academic misconduct, violations of standards of academic conduct will be sanctioned by penalties ranging from grade reduction or failure on an assignment; grade reduction or failure of a course; up to dismissal from the school, depending on the nature and context of any infraction (http://uss.tufts.edu/studentaffairs/judicialaffairs/Academic%20Integrity.pdf).
### Course & Assignment Schedule:

<table>
<thead>
<tr>
<th>DATE</th>
<th>SESSION</th>
<th>TOPIC</th>
<th>ASSIGNMENTS &amp; ACTIVITIES</th>
<th>LECTURER(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/12/16</td>
<td>1</td>
<td>Review of Syllabus and timeline for the course, Introduction to Science based interventions targeting malnutrition: Public health and Epidemiology, Linking Evidence to Programming</td>
<td>Readings</td>
<td>Shibani Ghosh</td>
</tr>
<tr>
<td>9/19/16</td>
<td>2</td>
<td>Introduction to Science Based interventions: Syndromes, definitions, etiologies</td>
<td>Readings</td>
<td>Irwin Rosenberg</td>
</tr>
<tr>
<td>9/26/16</td>
<td>3</td>
<td>Elements of etiologies going beyond nutrients: Environmental Enteropathy, Infection and Immunity</td>
<td>Readings and Student Presentation</td>
<td>Irwin Rosenberg</td>
</tr>
<tr>
<td>10/3/16</td>
<td>4</td>
<td>Evidence base for the prevention and treatment stunting and acute malnutrition</td>
<td>Readings and Student Presentation</td>
<td>Shibani Ghosh</td>
</tr>
<tr>
<td>10/10/16</td>
<td></td>
<td>Columbus day Holiday</td>
<td></td>
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<tr>
<td>10/17/16</td>
<td>5</td>
<td>Iron: Evidence base around interventions targeting iron status in vulnerable populations</td>
<td>Readings and Student Presentation</td>
<td>Irwin Rosenberg</td>
</tr>
<tr>
<td>10/24/16</td>
<td>6</td>
<td>Folic acid and Vitamin B 12: Evidence base, issues and controversies</td>
<td>Reading and Student Presentation</td>
<td>Irwin Rosenberg</td>
</tr>
<tr>
<td>10/31/16</td>
<td>7</td>
<td>Zinc: Role of zinc in human health (growth and diarrhea)</td>
<td>Readings and Student Presentation</td>
<td>Shibani Ghosh</td>
</tr>
<tr>
<td>11/7/16</td>
<td>8</td>
<td>Vitamin A: Evidence base, controversies, future directions</td>
<td>Readings and Student Presentation</td>
<td>Shibani Ghosh</td>
</tr>
<tr>
<td>11/14/16</td>
<td>9</td>
<td>Protein quality</td>
<td>Readings and Student Presentation</td>
<td>Shibani Ghosh</td>
</tr>
<tr>
<td>11/21/16</td>
<td>10</td>
<td>Energy, Fats and Essential Fatty acids</td>
<td>Readings and Student Presentation</td>
<td>Shibani Ghosh</td>
</tr>
<tr>
<td>11/28/16</td>
<td>11</td>
<td>Vitamin D</td>
<td>Readings and Student Presentation</td>
<td>Shibani Ghosh</td>
</tr>
<tr>
<td>12/5/16</td>
<td>12</td>
<td>Iodine</td>
<td>Readings and student Presentation</td>
<td>Shibani Ghosh</td>
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<tr>
<td>12/12/16</td>
<td></td>
<td>Last day of Classes</td>
<td>Remaining Student presentations</td>
<td></td>
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This schedule is subject to modifications at the discretion of the instructor.
Class 1: Review of Syllabus and Timeline for Course and Introduction to Science based interventions targeting malnutrition: Public health and Epidemiology

9/12/2016, Monday 1:30-4:30, Jaharis 156
Instructor: Shibani Ghosh

Learning Objectives for class 1: Upon completion of this class, students will be able to:

- Basic definitions in public health nutrition and epidemiology
- Linking evidence base to current programming

Required Readings for class 1:


Additional Readings:

Class 2: Introduction to Science based interventions targeting malnutrition: Syndromes, definitions, etiologies

9/19/2016 Monday 1:30-4:30, Jaharis 156
Instructor(s): Irwin Rosenberg

Learning Objectives for class 2: Upon completion of this class, students will be able to:

- Define malnutrition and its etiologies
- Define the metrics of malnutrition
- Name major nutrient deficiencies of public health relevance
- Understand evidence based approaches in interventions around moderate acute malnutrition

Required Readings for class 2:

Learning Objectives for class 3: Upon completion of this class, students will be able to:

- Define malnutrition and its etiologies – role of infection/environment

Required Readings for class 3:


Additional Readings:

Class 4: Evidence base for the treatment and prevention of stunting
10/3/2016 Monday 1:30-4:30, Jaharis 156
Instructor(s): Shibani Ghosh

Learning Objectives for class 4: Upon completion of this class, students will be able to understand:

- The role of nutrition and agriculture in the prevention of stunting
- Understand the role of food supplementation and/or nutrition education, WASH, control of open defecation, aflatoxin exposure and enteric disease in prevention of stunting
- Maternal nutrition and stunting
- Stunting and the first 1000 days- is there potential for catch up?
- Review the link of stunting and wasting

Required Readings for class 4


Additional References

Class 5: Iron: Evidence base around interventions targeting iron status in vulnerable populations

10/17/2016, Monday 1:30-4:30, Jaharis 156
Instructor(s): Irwin Rosenberg

Learning Objectives for class 5: Upon completion of this class, students will be able to:

- Evidence around iron supplementation and fortification
- Issues around iron supplementation and malaria and impact on anemia levels (Public health)
- Iron/folate supplementation in tandem with intermittent preventive treatment of malaria in pregnant women

Required Readings for class 5:


Class 6: Folic acid and Vitamin B 12: Evidence base, issues and controversies

10/24/2016, Monday 1:30-4:30, Jaharis 156
Instructor(s): Irwin Rosenberg

Learning Objectives for class 6: Upon completion of this class, students will be able to:

- Understand the evidence for folic acid supplementation
- Discuss issues and controversies surrounding supplementation/fortification
- Understanding the evidence of folic acid supplementation in pregnancy, childhood and pre-conception

Required Readings for class 6:


Additional Reading

Learning Objectives for class 7: Upon completion of this class, students will be able to:

- Introduction to Type 1 versus Type 2 nutrients
- Role of zinc in diarrhea management and improving growth
- Understand the public health relevance of zinc deficiency and its effects on health
- Issues associated with linking type 2 nutrients to non specific outcomes like linear growth
- Understand the role of multiple micronutrients in improving health and nutrition outcomes
- Understand the differences between multiple and single nutrient interventions

Required Readings for class 7:


Additional References:


# Learning Objectives for class 8

Upon completion of this class, students will be able to:

- Concepts of sub clinical versus clinical deficiency states of Vitamin A
- Role of Vitamin A in addressing child hood mortality
- Vitamin A supplementation in infants and young children
- Role of Vitamin A in addressing (or not) child morbidity
- Controversies in approaches used to target Vitamin A

## Required Readings for class 8:


## Additional References:

1. Noel Solomons’ chapter on Vitamin A in *Present Knowledge in Nutrition*
2. WHO Vitamin A Guidelines (6 separate documents)
Class 9: Protein quality

11/14/2016, Monday 1:30-4:30, Jaharis 156
Instructor(s): Shibani Ghosh

Learning Objectives for class 9: Upon completion of this class, students will be able to:

- Understand the role of essential amino acids in weight gain and linear growth and the potential mechanisms for such impacts
- Understand the emerging role of non essential amino acids and their impact on growth
- Understand the association of protein quality to linear growth
- Understand the role of other components in animal source foods (such lactoglobulins) on growth

Required Readings for class 9:


Additional References:

Class 10: Energy, Fats and Essential Fatty acids

11/21/2016, Monday 1:30-4:30, Jaharis 156
Instructor(s): Shibani Ghosh

Learning Objectives for class 10: Upon completion of this class, students will be able to:

- Concepts of energy, macronutrient balance
- Energy Excess (overweight and obesity) and Energy Deficit (wasting)
- Concepts of essential fatty acids and their role in affecting nutrition outcomes
- Understand the role of essential fatty acids in visual acuity and cognition of pre-term and term infants, growth of infants

Required Readings for class 10:

3. Willatts., P. And Forsyth JS. The role of long-chain polyunsaturated fatty acids in infant cognitive development Prostaglandins, Leukotrienes and Essential Fatty Acids Volume 63, Issues 1-2, July 2000, Pages 95-100

Additional References:

Class 11: Vitamin D

11/28/2016 Monday 1:30-4:30, Jaharis 156
Instructor(s): Shibani Ghosh

**Learning Objectives for class 11:** Upon completion of this class, students will be able to:

- Vitamin D deficiency and its clinical manifestations
- Current public health perspective of Vitamin D deficiency

**Required Readings for class 11:**

Class 12: Iodine

12/5/2016, Monday 1:30-4:30, Jaharis 156

<table>
<thead>
<tr>
<th>Learning Objectives for class 12: Upon completion of this class, students will be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Iodine deficiency disorders and their clinical manifestations</td>
</tr>
<tr>
<td>• Role of salt iodization in tackling iodine deficiency disorders</td>
</tr>
<tr>
<td>• Current public health perspective of iodine deficiency disorders</td>
</tr>
</tbody>
</table>

| Required Readings for class 12: |
| 1. WHO Secretariat on behalf of the participants to the Consultation, M Andersson, B de Benoist, F Delange and J Zupan. Prevention and control of iodine deficiency in pregnant and lactating women and in children less than 2-years-old: conclusions and recommendations of the Technical Consultation. Public Health Nutrition, vol 10, no. 12a, 1606-1611, December 2007 |
Class 13:

12/12/2016, Monday 1:30-4:30, Jaharis 156